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Oliver E. Baker, *Agricultural Economist, U. S. Dept. of Agriculture*

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EVOLUTION OF BRAZILIAN COMMERCE
Clarence F. Jones, *Economic Geographer, Clark University*

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THE TROPICS

THE tropics have ever challenged the imagination of the white man, yet ever have they withstood his conquest. Their riches have roused his lust for possession and exploitation, but their insidious fevers and enervating winds have broken his body as they have wrecked his will. Beaten back time and again from the jungle frontier he has returned again and ever again to the struggle, impatient of his impotence.

Now he stands upon the threshold of success. His marvelous achievements in medicine and engineering have given him advantage in the contest, and he seems in fair way of pressing his advantage to victory. The death-distributing insects, the body-breaking fevers and malarias, the rotting heat and ruinous rain, all the terrors of the tropic jungle are giving way to the white man's persistent attacks. He has penetrated to the tropical hearts of Africa, South America, and Oceania, and gained his foothold there.

But for himself, his may be but a Pyrrhic victory. As he subdues the tropics, their native populations expand with prolific progeny to possess themselves of the wealth the white man seeks, and the rich lands and resources become but the nurseries of teeming millions of yellow and brown and black peoples who riot in the riches that the white man wins for them. The white man may not too confidently hope that the tropic jungle will ever yield him surplus of food and fibre and raw material to fill his storehouses and granaries, to feed his mills and factories, to enrich his coffers and treasuries. Rather will the tropics hold their own for their own peoples!

AGRICULTURAL REGIONS OF NORTH AMERICA

Oliver E. Baker

Agricultural Economist, U. S. Department of Agriculture

Professor of Agricultural Geography, Clark University

Part I. The Basis of Classification

NORTH AMERICA is one of those major economic areas of the world which produces or can produce most of the commodities it needs. Especially is this true of agricultural products. The only agricultural commodities which are imported in large quantities are silk, rubber, hides, wool, vegetable oils, coffee, tea, and cocoa. The manufacture of rayon is diminishing rapidly the dependence of North America on Asia for silk; a concerted effort is being made to make the United States independent of the East Indies for its rubber; synthetic substitutes are slowly replacing leather; much of the wool needed is produced in North America and probably more will be as crops encroach upon the pastures in South America and Australia; the vegetable oils are at present extensively produced in the flax fields of Canada, the cotton fields of the South and the coconut plantations of the West Indies, while coffee and cocoa are grown in considerable and increasing quantities in the West Indies and Central America. Only tea remains among the important agricultural imports as a product which North America must continue to secure from other parts of the world, principally because the labor cost is so much less elsewhere.

It will be noted that of these important agricultural imports from beyond the boundaries of North America only the vegetable oils contribute appreciably to the food supply of the United States. Scarcely a thousandth part of our food supply, measured in calories, is procured from other continents. And although South America, Africa and Asia, particularly Siberia, afford large opportunities for agricultural expansion, it appears probable that the United States will remain in the future almost as independent of these continents for its food supply as it is today. On the other hand, it seems certain that it will become increasingly dependent upon other parts of North America.

As population becomes greater and the people of the United States begin to need wheat and milk from Canada, and an ever greater quantity of sugar from Cuba, bananas from Central America, and beef from Mexico, while the consumers in the cities outvote the producers on the farms, it seems inevitable that the high tariff barriers which seriously impede the interchange of agricultural products between the nations of North America, gradually will be reduced under urban pressure and the continent will stand forth more and more clearly as a natural economic area. (See Fig. 1)

It is desirable, therefore, that the people of the United States should learn not only of the agricultural resources of their own nation but also of the agricultural products and resources of the neighboring nations to the north and south. This series of articles with accompanying maps is offered as an introductory survey of the subject, and it is hoped that its very brief, highly generalized, and mostly statistical statements will lead some of its readers to further study of the agricultural resources of our continent.

The Physical Conditions Affecting Agricultural Development

In the modern world, especially in the United States and Canada, where peace

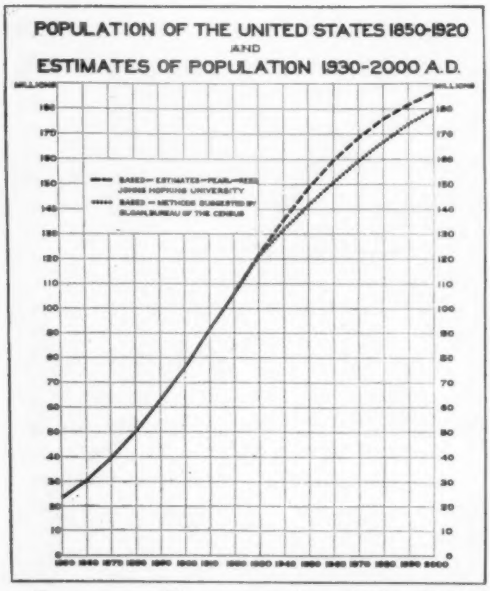

POPULATION OF THE UNITED STATES 1850-1920
AND
ESTIMATES OF POPULATION 1930-2000 A.D.
MILLIONS
BASED — ESTIMATES — PEARL — REED, JOHNS HOPKINS UNIVERSITY
BASED — METHODS SUGGESTED BY BUREAU OF THE CENSUS

FIGURE 1.—The population of the United States is increasing by about 1,500,000 a year, to which may be added perhaps 200,000 for Canada, and even if these annual increments should diminish as population becomes denser, it is not improbable that the combined population of these two nations a century hence will be nearly double what it is today. Since the good land is practically all in use at present and crop production has spread onto the less fertile semi-arid lands of the West, the sandy areas of the Lakes States, and the leached soils of the South, it seems almost certain that the utilization of the agricultural resources of the continent will receive an increasing amount of study as the years pass. (Graph from article by the author in *Geographical Review*, Jan., 1923.)

and the protection of life and property are equally well assured in all parts, and excellent transportation facilities diminish the importance of location with reference to markets, the physical conditions are the principal factors influencing agricultural development (see Fig. 2). For this reason they have been given primary consideration in this classification of North America into agricultural regions and sub-regions.[1] These physical conditions may be grouped into four classes:

(1) Moisture conditions; that is, rainfall, snowfall, hail, fog, humidity, rate of evaporation (see Fig. 3).

(2) Temperature conditions, particularly growing-season temperatures and dates of occurrence of spring and fall frosts (see Fig. 4).

(3) Topography, or land form; that is, the configuration of the earth's surface, degree and direction of slope, roughness or smoothness of the land (see Fig. 5).

(4) Soils, including both physical structure and chemical and bacteriological characteristics (see Fig. 6).

Not only are these physical conditions the principal factors in determining the utilization of the land in a region and the crops grown; but also they become more important as population increases, the knowledge and practice of agriculture advance, transportation facilities are improved, and the supply of capital and labor is increased and better distributed; in brief, as agriculture and forestry become more highly organized and commercialized.

This thesis deserves brief discussion, because it is desirable that in dividing a continent into agricultural regions the basis of the classification consist of conditions that are as permanent and unalterable as anything can be in this changing world.

The Increasing Importance of Topography

The invention and extensive use in the United States of farm machinery, which is constantly becoming more efficient and essential to profitable crop production, has greatly increased and is

[1] Especially have changes in land surface or soils been used in assigning an exact boundary to an agricultural region. The southern boundary of the Corn Belt, across Ohio and most of Indiana, for instance, is drawn along the southern margin of the Wisconsin glaciation, because the recently formed soils to the north of the margin are much more fertile than the more or less leached lands to the south, and this difference in fertility will always cause differences in the agriculture in spite of any changes that may occur in the systems of farming. It happens that the production of corn during the five years, 1920–24, in every county north of this line was above 3,000 bushels, and in nearly every county south of the line was less than 3,000 bushels, but the advent of the corn borer or a change in relative price of corn and wheat might alter this density of production, and thus induce vacillation in the boundary, if it were determined solely by density of corn production.

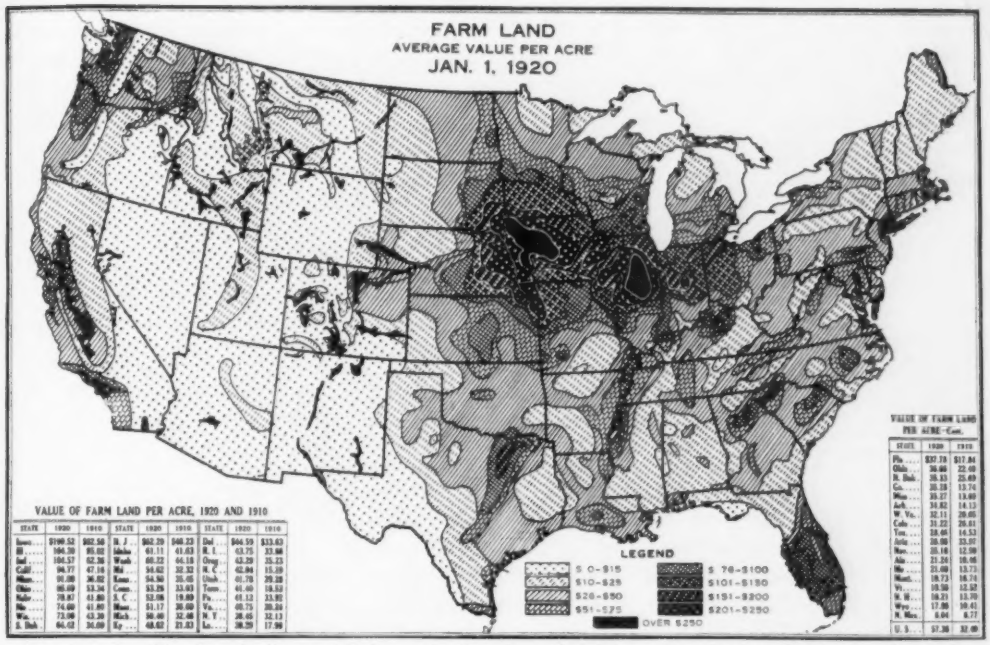


FIGURE 2.—The best indicator of the agricultural productivity of land, though often an imperfect one, is its value. In this map it will be noted that the land values are low in the western half of the United States, except along the Pacific Coast and in the irrigated districts. This is because the climate is too dry for the production of crops in most of this region, or else the land is too rough and mountainous. The areas of highest land values in the United States are the areas of richest soils—central Illinois, central and western Iowa, the Yazoo-Mississippi delta, the Black Prairie of Texas, and the irrigated districts of the West.

Proximity to large cities, apparently, does not overcome the influence of soil fertility in determining land values, except around New York City, where the values are largely residential. Note how the land value lessens from central Illinois toward Chicago, from the Blue Grass district of Kentucky toward Cincinnati, from the livestock lands of Lancaster County, Pennsylvania toward Philadelphia. The densest population in the United States is in Pennsylvania, New York and New England, yet farm land values in these States are among the lowest in the United States. Modern transportation facilities have made land values very largely a reflection of the physical conditions of climate, land surface and soils. (Map from "Graphic Summary of American Agriculture," 1921 Yearbook, U. S. Dept. of Agriculture.)

still increasing the influence of topography in determining the utilization of land. Hilly regions, in addition to the former drawbacks of lesser accessibility as compared with level lands, and the disadvantages of shallower and less fertile soils, now suffer from the further disadvantage of being poorly adapted to the use of modern farm machinery. Certainly in the production of cereal crops, and probably also of hay, one man can farm twice the area of level land that he can of hill land; and if the level land be more fertile, as is usually the case, the handicap of the hill-land farmer is further increased. In the hill-land counties of New England, New York, and western North Carolina, and in the Sierras of California, the Census shows a decrease in improved land for several decades (Fig. 7).

On the other hand, the level surface of much of the land in the semi-arid sections of the Great Plains, which permits the use of the most modern machinery, makes the production of grain profitable under much more arid conditions than is the case where less efficient machinery must be used.

Because of erosion as well as the increased cost of cultivation, land having a slope of over fifteen feet in 100 feet horizontal distance generally should not be put into crops, but kept in pasture or forest, and land in humid regions having over twenty-five feet of slope in 100

should be kept in forest, since if put into crops, or even used for pasture, the soil is likely to wash away. Large areas of rolling land, in the Southern states especially, have been seriously injured by being plowed and put into crops.

The Increasing Importance of Original Soil Fertility

Inherently fertile land not only produces permanently a larger quantity of the staple farm crops than land less fertile, but also its capacity to utilize profitably larger amounts of capital and labor increases with its fertility. Because of this greater capacity to utilize capital and labor, and because of its greater productivity with the application of the same capital and labor, the best farm land has, in general, increased more rapidly in value than good farm land, good farm land more rapidly than fair land, and fair farm land more rapidly than poor land.

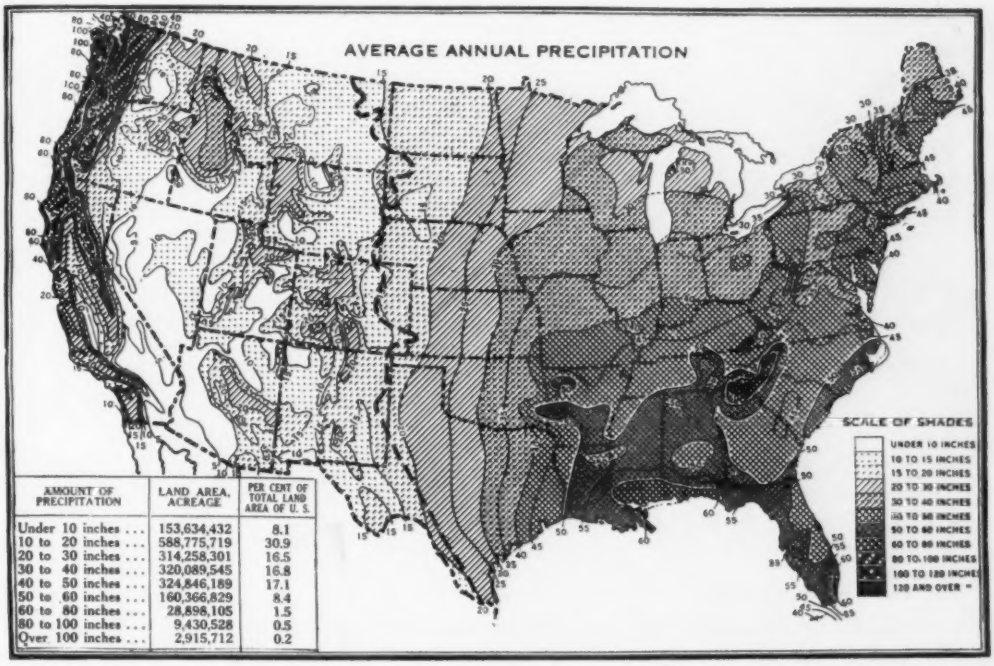
This fact is illustrated by the following table, which shows changes in average value of farm land per acre in four groups of counties in Illinois and Ohio from 1900 to 1920:

	Value per Acre			Increase in Value,	Percentage Increase,	Increase in Value,	Percentage Increase,
Illinois	*1900*	*1910*	*1920*	*1900–10*	*1900–10*	*1910–20*	*1910–20*
First group of twenty-five counties having highest land value in 1900	$68.50	$145.30	$259.60	$76.80	112	$114.30	79
Second group of twenty-six counties	50.50	102.50	180.80	52.00	103	78.30	76
Third group of twenty-five counties	33.60	70.10	114.40	36.50	109	44.30	63
Fourth group of twenty-six counties having lowest land values in 1900	19.00	35.90	50.60	16.90	89	14.70	41
Ohio							
First group of twenty-two counties having highest land value in 1900	51.30	82.60	135.30	31.30	61	52.70	64
Second group of twenty-two counties	37.30	65.60	109.50	28.30	76	43.90	67
Third group of twenty-two counties	28.90	45.10	67.90	16.20	56	22.80	51
Fourth group of twenty-two counties having lowest land values in 1900	18.10	23.70	36.00	5.60	31	12.30	52

The Census returns show clearly that the trend during the decade 1910–1920 was toward the more intensive use of the more fertile or favorably situated land, that is, its use for crops rather than pasture; and, apparently, toward the less intensive use of the less fertile land, that is, its use for unimproved pasture and forest. Increased production has been achieved in large part by closer adaptation of the use of the land to the geographic conditions, and by greater concentration of labor and capital on the more productive lands, that is, by more intensive cultivation.

The Increasing Importance of the Moisture Factors

The development of modern agricultural machinery, which has greatly increased the acreage of crops that a man can handle, especially of the small grains, the increasing knowledge of dry-farming practices, and the breeding of drought-resistant varieties of plants, particularly wheat, have extended notably the area available for crop production in the United States. But in the arid areas of the West the small grains are precarious crops; the necessity of diversification and the choice of systems of farming better adapted to the fluctuating seasonal conditions become apparent. Consequently, the suitability of the varying soils and sites to different



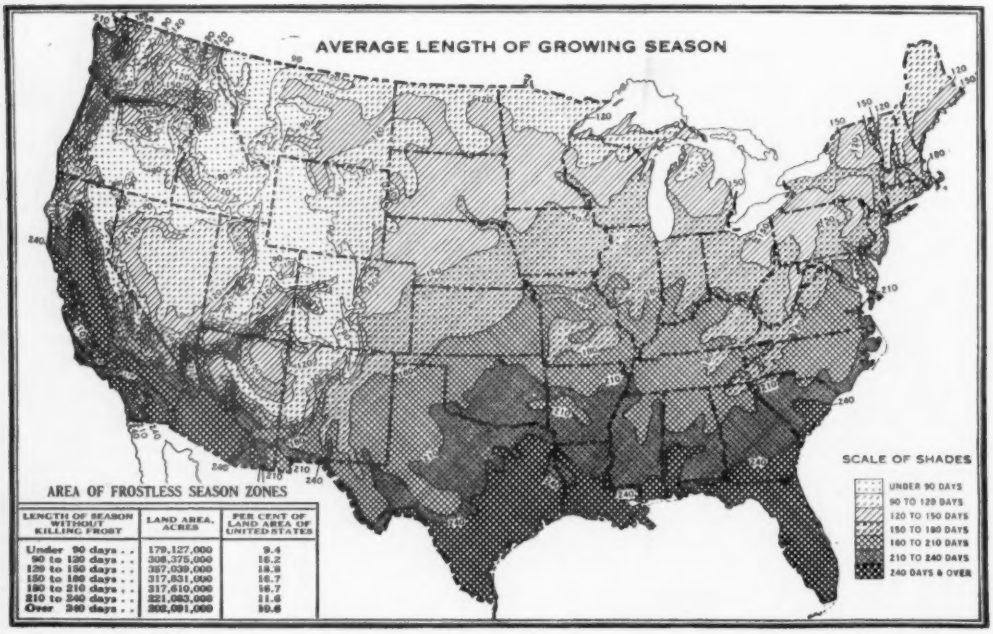
AMOUNT OF PRECIPITATION	LAND AREA, ACREAGE	PER CENT OF TOTAL LAND AREA OF U. S.
Under 10 inches ...	153,634,432	8.1
10 to 20 inches ...	588,775,719	30.9
20 to 30 inches ...	314,258,301	16.5
30 to 40 inches ...	320,089,545	16.8
40 to 50 inches ...	324,846,189	17.1
50 to 60 inches ...	160,366,829	8.4
60 to 80 inches ...	28,898,105	1.5
80 to 100 inches ...	9,430,528	0.5
Over 100 inches ...	2,915,712	0.2

FIGURE 3.—Precipitation includes rain, melted snow, sleet, and hail. The map is much reduced and generalized from a map prepared by the Weather Bureau and published in the Precipitation and Humidity section of the Atlas of American Agriculture. The map suggests why the United States should be divided agriculturally into an eastern and a western half. However, the eastern boundary of the Grazing and Irrigated Crops Region shown in the map above by a broken line does not follow a line of equal precipitation, but advances diagonally across two of the precipitation zones from 14 inches in the northeastern corner of Montana to 24 inches in southern Texas, where the evaporation is much greater and the rainfall more torrential and where, consequently, more moisture is required for crop production.

uses, especially with reference to moisture conditions and requirements, is being studied in more and more detail. Provision is now made more frequently to irrigate a part of the valley bottoms by means of flood water, or otherwise, and it is becoming recognized that in most cases only dark-brown, level land on the higher benches, where the rainfall is a little heavier, should be plowed up and put into dry-land crops, the other non-irrigable land remaining in native pasture. In other words, as competition for the use of the land becomes keener, and arid agriculture, like humid, becomes commercialized, and as the better lands rise in value, necessitating an increase in productivity, the use of the land must be adapted to the moisture conditions with greater care and precision. In the semi-arid region, as elsewhere in the United States, the trend is toward the more intensive utilization of the better, in this case the moister, land.

The Increasing Importance of the Temperature Factors

The increasing influence of temperature conditions in determining the utilization of the land, as agriculture becomes more highly developed and commercialized, may be illustrated by the changes that have taken place in the geography of the dairy industry in Wisconsin. Wisconsin now has more dairy cows and probably produces more milk than any other state in the Union. In April, 1920, there were 2,752 cheese factories in the state, 762 butter factories, 67 plants for condensed and evaporated milk, and the total value of dairy products was estimated at $277,000,000. The development of the dairy industry in this state has been due largely to tem-


AVERAGE LENGTH OF GROWING SEASON
SCALE OF SHADES
UNDER 90 DAYS
90 TO 120 DAYS
120 TO 150 DAYS
150 TO 180 DAYS
180 TO 210 DAYS
210 TO 240 DAYS
240 DAYS & OVER
AREA OF FROSTLESS SEASON ZONES

LENGTH OF SEASON WITHOUT KILLING FROST	LAND AREA, ACRES	PER CENT OF LAND AREA OF UNITED STATES
Under 90 days . .	179,127,000	9.4
90 to 120 days . .	308,375,000	16.2
120 to 150 days . .	357,039,000	18.8
150 to 180 days . .	317,831,000	16.7
180 to 210 days . .	317,610,000	16.7
210 to 240 days . .	221,083,000	11.6
Over 240 days . .	202,091,000	10.6

FIGURE 4.—This map is much reduced and generalized from a map prepared by the United States Weather Bureau and published in the Frost and the Growing Season section of the Atlas of American Agriculture. The higher altitude of much of the Grazing and Irrigated Crops Region (see Fig. 5), and the drier air (see Fig. 3), which permits rapid loss of heat at night, are two important causes of the short frost-free season. Over much of this region the frost-free season is shorter than in northern Maine or Minnesota. The powerful influence of the Pacific and the lesser influence of the Atlantic in lengthening the growing season along their shores should also be noted.

perature conditions. First, the cool summer temperatures favor a low bacterial content in the milk and the production of a quality of dairy products, especially cheese, which is not readily obtainable in warmer climates. Second, the low temperature and high summer rainfall promote pasturage of high quality which is best utilized by dairy cows, and which also reduces the agricultural work of the summer, so far as the feeding of cattle is concerned. Third, for the same reasons, corn can be grown for silage, but not so satisfactorily for grain, and the silage, together with hay, the production of which is favored by the climate, provides excellent winter feed for dairy cattle. Fourth, dairying affords profitable employment to the rural population during the winter, and thus is peculiarly adapted to the climatic conditions existing in the state.

Within the state, moreover, there has occurred a geographic division of the territory between the production of butter and of cheese which also has been due largely to the influence of temperature conditions. In 1875, when the dairy industry in Wisconsin was in its infancy, cheese factories and creameries were intermingled in the southeastern portion of the state, to which section they were largely confined at that time. When economic forces began to compel adjustment to geographic conditions, the cheese factories were forced to abandon the warmer southeastern section of the state for more favorable locations on the highlands to the west and along the Lake Michigan shore counties to the northeast. By 1910 all the cheese factories in southeastern Wisconsin had gone out of business, leaving the creameries to possess the region (except for city-milk production). On the other hand, in the highlands to the west, the 37 cheese factories of 1875 had increased in number to 577 by 1910, while only 17

creameries remained in this highland district, and most of these were located in the warmer, lower and more sandy river valleys. A similar development of the cheese industry and decline of the butter industry occurred in the cooler Lake Michigan shore counties (Fig. 8).

FIGURE 5.—This map shows the topography of the United States in a generalized way. It is a photograph of a relief model of the United States supplied by the United States Geological Survey. The mountainous character of the western regions is clearly shown; but the map fails to show the high altitude of much of the West, particularly of a large portion of the Grazing and Irrigated Crops Region. Owing to the altitude, this region has a much cooler climate than corresponding latitudes in the East. The vast expanse of the Mississippi Valley, with its level to rolling surface, except for the Ozark uplift in the lower central portion, should be especially noted.

Effect of Commercialization of Agriculture Upon the Influence of the Physical Conditions

Progress in civilization does not diminish man's dependence upon Nature. Instead, each advance in transportation facilities, in the technique of production, and in economic organization makes agriculture, at least, increasingly responsive to the conditions of temperature, moisture, topography and soil. The control of the physical conditions over agricultural development, instead of being mitigated by the progress of science and invention, has been intensified and enforced. The commercialization of agriculture and the keen competition resulting between different regions make the production of a crop sensitive even to the more minute geographic advantages or disadvantages of a district, and compel shifts in crop production or in use of the land to be made with an alacrity unknown in previous ages.

Flax, for instance, in the old self-sufficing agriculture of the Colonial and early national eras, was grown on almost every farm within its climatic range in order to provide linen for the farm family; but now its production, almost wholly for oil, is practically restricted to the subhumid areas of the Northwest, where the physical conditions, relative to the value of the land, are peculiarly favorable; and the flax fiber that we need is grown in Russia and northern Europe, manufactured into linen in Ireland, and then sold in the United States much cheaper than it can be produced here. Cotton, similarly, was

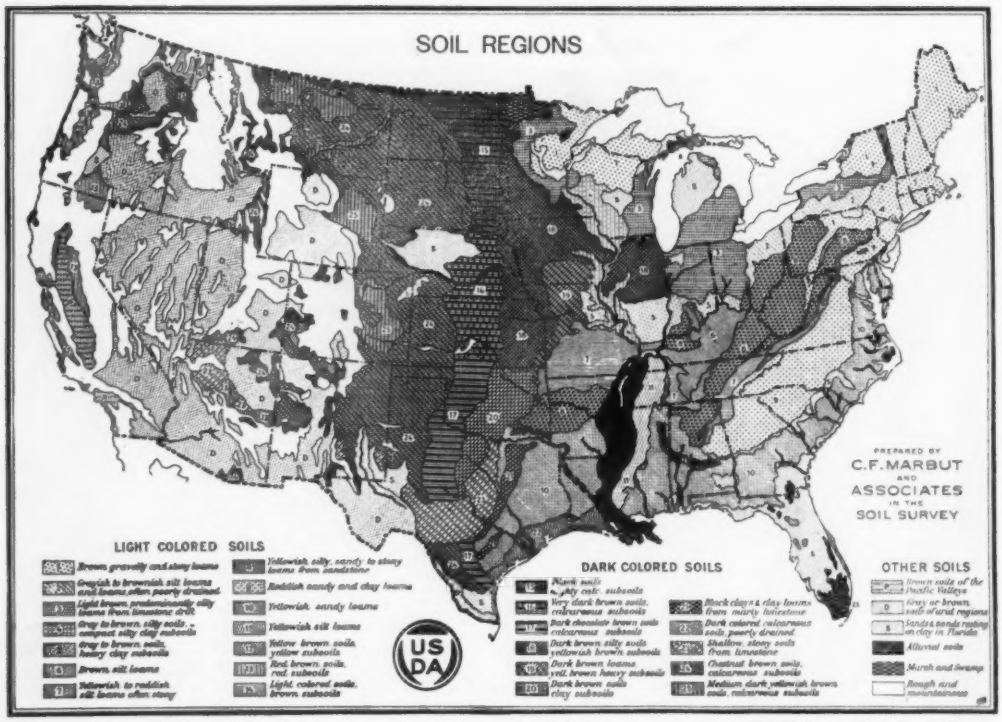


FIGURE 6.—Soils originally or at present covered with forest are normally light colored, and are likely to be less fertile than soils in regions of lower rainfall. Grassland soils, in general, are dark colored, the humid prairie soils being commonly almost black and highly fertile—the subhumid prairie soils, blackest of all—while the semiarid short-grass plains soils are dark brown or chocolate colored, the color gradually fading to medium brown in regions of lesser rainfall, and to light brown or even ashy gray in desert areas. The light-colored forest soils in the United States total about 800 million acres, the dark-colored grassland soils about 600 million acres, and the light-colored arid soils about 500 million acres.

The Cotton Belt, Corn and Winter Wheat Belt, and Hay and Dairying Belt have almost wholly light colored (forest) soils; whereas the Corn Belt has largely, and the wheat regions have almost wholly, dark colored (grassland) soils. (Map from 1921 Yearbook, U. S. Dept. of Agriculture.)

grown in former years for home use farther north than at present, but with the commercial development of the cotton industry, the competition of the localities to the south, where the season was longer and the yields higher, rendered production in these peripheral areas unprofitable, and caused the Cotton Belt to contract within its present boundary.

These basic physical conditions of temperature, moisture, topography, and soil, in conjunction with the factor of location with reference to markets, determine in large degree the geographic distribution of the various crops, the different classes of livestock, and the combination of crop and livestock enterprises into systems of farming, in brief, the agriculture of a region.

THE PRIMARY CLIMATIC DIVISIONS

North America is divided by temperature conditions into three major zones: a northern or frigid, confined practically to northern Canada and Alaska, which is too cold for crop production; a southern, tropical, or frostless zone, confined to Central America, southern Mexico and the West Indies, and characterized by an agriculture and people so different from those found to the north as to require separate consideration; and an intermediate or temperate zone, comprising most of the agricultural land and the population of the conti-

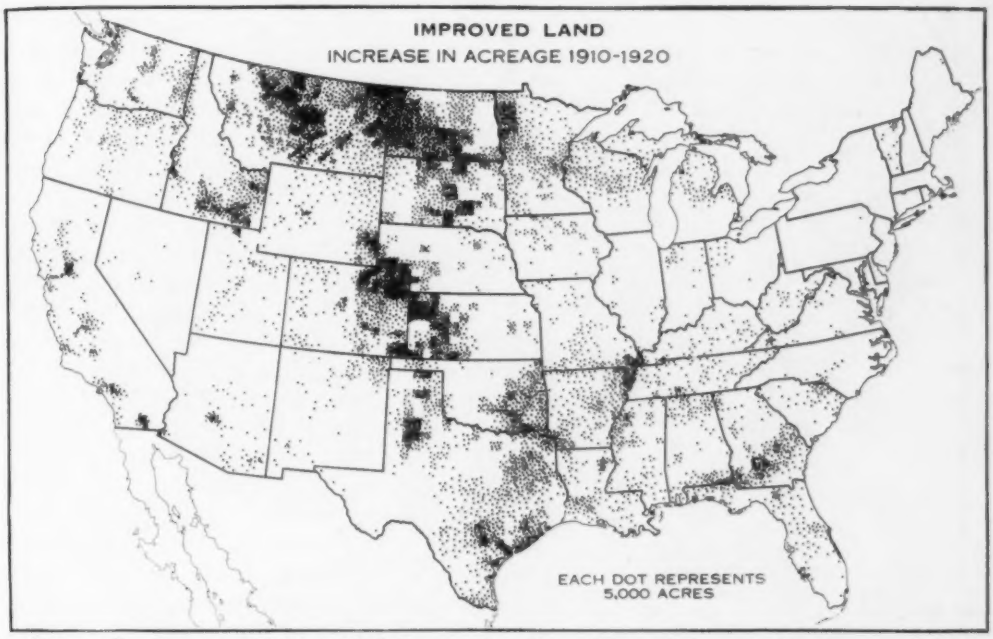


FIGURE 7.—Between 1910 and 1920 the war-time demand caused about double the normal decennial increase in agricultural production. Despite this abnormal demand for food and fibres practically no increase in the area of improved land occurred in the hilly portions of the United States. On the contrary, a considerable decrease took place in most of New England, in New York and Pennsylvania, in the mountains of North Carolina and in the Sierras of California. The increase of improved land was notable on the level lands where machinery could be used most efficiently,—on the Northern Plains of the Dakotas and Montana, on the Central Plains of eastern Colorado, Western Kansas and the Texas Panhandle, and on the Coastal Plain of the South. (Map prepared in U. S. Dept. of Agriculture.)

nent, and possessing those attributes usually associated with the name North America. This intermediate or temperate zone is divided agriculturally into two parts, an eastern humid part in which crop production is the dominant form of agriculture, and a western arid part in which, with the exception of irrigated districts and a few other areas, grazing the native vegetation yields animal products of greater value than that of the crops grown.

Thus, on the basis of both temperature and moisture, as these find expression in the utilization of the land, North America is divided, first of all, into four parts, a cold northern, a warm southern, a moist eastern and a dry western part. Of the nearly 5,500 million acres of land in North America, about 1,800 million acres are in the northern non-agricultural part, 2,000 million are in the eastern agricultural part, 1,200 million are in the western grazing part, and less than 300 million are in the southern, tropical portion. The northern part includes all of Canada north of a line extending from the mouth of the St. Lawrence River past the northern end of Lake Winnipeg to the northern boundary of Alberta; thence the line swings south around the various mountain ranges of British Columbia, advancing up the valleys, until finally it reaches the Pacific Ocean near Vancouver and follows the coast northward into Alaska. The southern, frost-free part includes the West Indies, Central America, and southern Mexico, except the high plateaus, and the coasts of Mexico as far north as Tampico on the east and Guaymas on the west.

A transition belt which follows the eastern front of the Rocky Mountains separates the moist eastern and dry western sections of the intermediate

FIGURE 8.—In 1875 soon after the development of commercial dairying in Wisconsin, cheese factories and creameries were intermingled in southeastern Wisconsin. But gradually the creameries, and later the demand for city milk, forced the cheese factories out of business in this warmer area, where a frost-free season over 150 days in length promoted the production of corn and silage and thus favored a winter dairying, butter production, skim milk, and hog system of farming. In the highland pasture area of southwestern Wisconsin and along the cool Lake Michigan shore, where pasturage is more important than corn, cheese factories have prospered, because pasturage is the cheapest feed. Sandy soils, like a long growing season, favor corn and winter butter production rather than pasturage and summer cheese production. (Adapted from map in Bulletin 223, Wis. Agric. Expt. Station, "The Climate of Wisconsin and Its Relation to Agriculture," by Whitson and Baker.)

area. This zone is semi-arid near the mountains; farther east it becomes subhumid as the lower moister lands to the east are approached. Along the humid eastern margin of this belt, commonly known as the Great Plains, the average annual precipitation increases from about 16 inches in central Alberta to 30 inches in southern Texas; while along the arid western margin the average annual rainfall increases from about 11 inches in southern Alberta to 20 inches in the lower Rio Grande Valley (Fig. 3). The region east of this transition belt is characterized by humid climate farming, based upon tilled crops, small grains, and tame hay and pasture; whereas the region west of this belt is characterized by wild hay and grazing, dry farming, winter crops in certain localities, and irrigation farming, with only small areas of ordinary farming under humid conditions such as characterize the eastern part. Within the transition belt itself these various systems of farming are intermingled; high "bench" lands where the rainfall is a little greater and the temperature somewhat less than in the adjacent valleys are planted to crops, especially if the soils are fertile; while the valleys and drier districts are used for pasture, or are irrigated locally.

Similar transition belts separate the northern or frigid zone from the temperate zone, and the temperate zone, in turn, from the tropical; but these transitions in temperature are more abrupt than the moisture transition belt, in so far as they affect the crops grown and the utilization of the land. The resultant belts are narrow and will consequently be disregarded.

DIVISION OF THE FOUR CLIMATIC PARTS OF NORTH AMERICA INTO AGRICULTURAL REGIONS

Since geographers have as yet no generally recognized terminology of landscape classification (such as family, genus, species and variety of the botanists), it becomes necessary to suggest such terms and define their use in this article.

Definition of Terms

The term agricultural region, as used in this paper, refers to a large (sub-continental) area of land characterized by homogeneity of agricultural conditions, especially crops grown, and sufficient dissimilarity from conditions in adjacent territory as to be clearly recognizable. Agricultural regions are usually determined principally by climatic conditions; because, on the one hand, temperature and moisture are more permanent and pervasive, that is, less readily altered and less rigidly localized than the surface conditions of slope and soil; while, on the other hand, the general distribution of

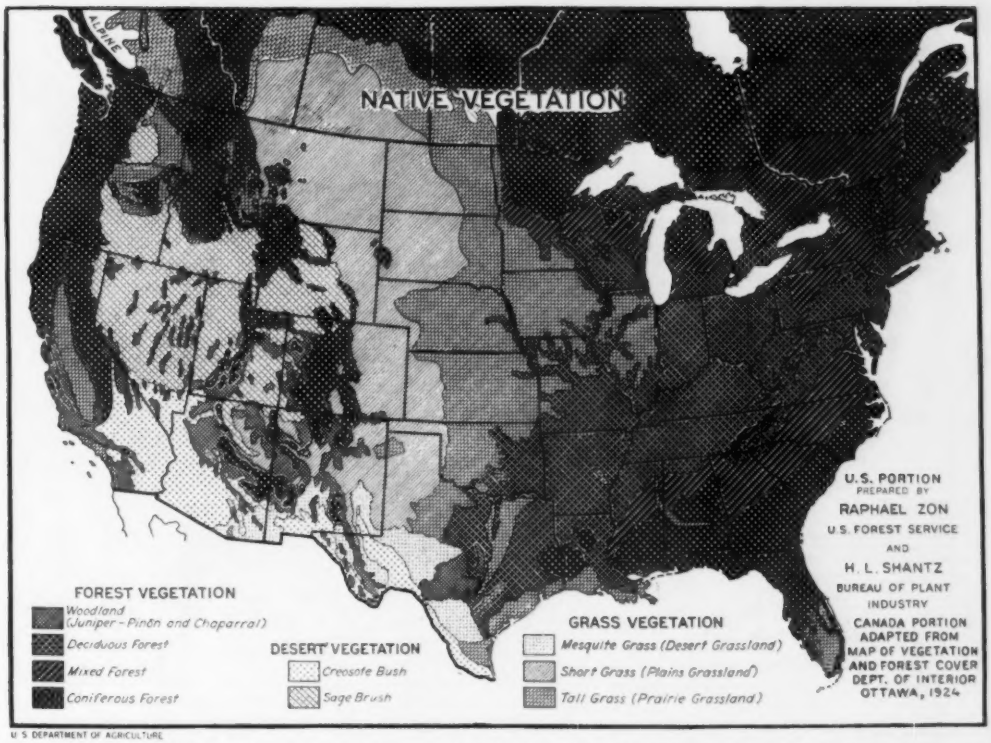


FIGURE 9.—Forest, including semiarid woodland (pinon-juniper, chaparral, etc.), originally covered about 850 million acres in the United States, and nearly 900 million acres in Canada. About 350 million acres have been cleared for agriculture in the United States, and approximately 35 million acres in Canada. As much more land has been cut-over or devastated. About 650 million acres in the United States, and perhaps 150 million acres in Canada, were clothed originally with grass, interspersed commonly with various herbaceous plants. Some 200 million acres of this grassland in the United States and about 45 million acres in Canada have been plowed up and used for crops, or for pasture in rotation with crops, including about 7 million acres irrigated. Desert vegetation characterized 400 million acres, of which about 13 million acres have been reclaimed by irrigation. Half of the remaining forest and woodland in the United States and southern Canada is pastured, practically all of the grassland, and nearly all of the desert.

Most of the Cotton Belt and of the Corn and Winter Wheat Belt, all of the Atlantic Trucking Region and practically all of the Hay and Dairying Region were originally covered with forest. The Corn Belt was mostly prairie, and the Hard Winter Wheat and Spring Wheat Regions were half prairie (long grass) and half plains (short grass). The Grazing and Irrigated Crops Region was and is largely covered with sage brush, while tall grass characterized the Columbia Plateau Wheat Region and the Pacific Subtropical Crops Region. Nearly all the North Pacific Hay and Pasture Region and the Northern Forest and Hay Region was originally and still remains covered with forest. (United States portion of map from 1921 Yearbook, U. S. Dept. of Agriculture; Canadian portion from map of "Vegetation and Forest Cover," Dept. of the Interior, Ottawa, 1924.)

the forest, grassland, and desert land of the world, and the possibility of growing a particular crop on such land, is determined primarily by climatic conditions.

Within an agricultural region differences in land relief, or in slope, and in soils may cause such variations in the proportion of the land used for crops, pasture or forest, or in the relative importance of the crops, as to require recognition, and the consequent division of the agricultural region into sub-regions or areas. The physical conditions in these sub-regions, in turn, especially the soil conditions, may induce such differences in utilization of the land and in the system of farming as to require the division of the sub-region into districts; and these districts, in turn, may be subdivided into localities. Indeed, the division in actual practice is often carried down to a single farm, almost every farmer recognizing

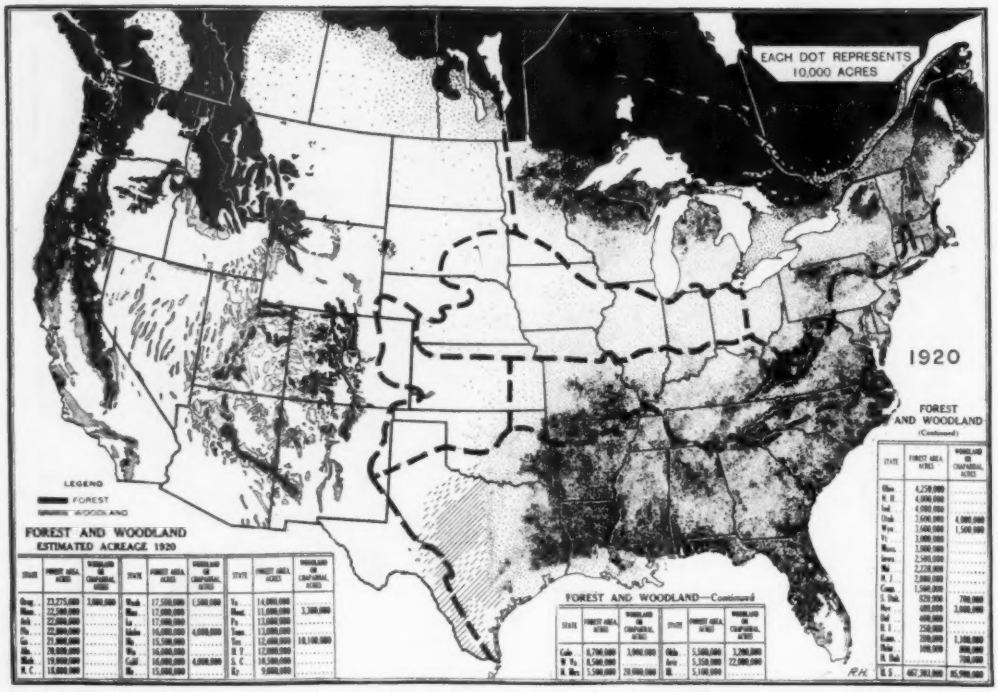


FIGURE 10.—This generalized map of forest, cut-over land, and woodland was prepared in coöperation with the Forest Service, except the Canadian portion, which is based on the 1921 census. The figures given in the table are merely tentative. The estimates for the States in the originally forested eastern portion of the United States, except for several States in which forest surveys have been made, are based largely on deductions from the statistics of the 1920 census.

Of the 490 million acres of forest and cut-over land in the United States in 1925 about one-half is in the South, one-eighth in the Northeastern States, one-eighth in the Lake States, and nearly one-quarter in the West, mostly in the Rocky Mountain and North Pacific Regions. However, over half of the 137 million acres of virgin saw timber is in the West.

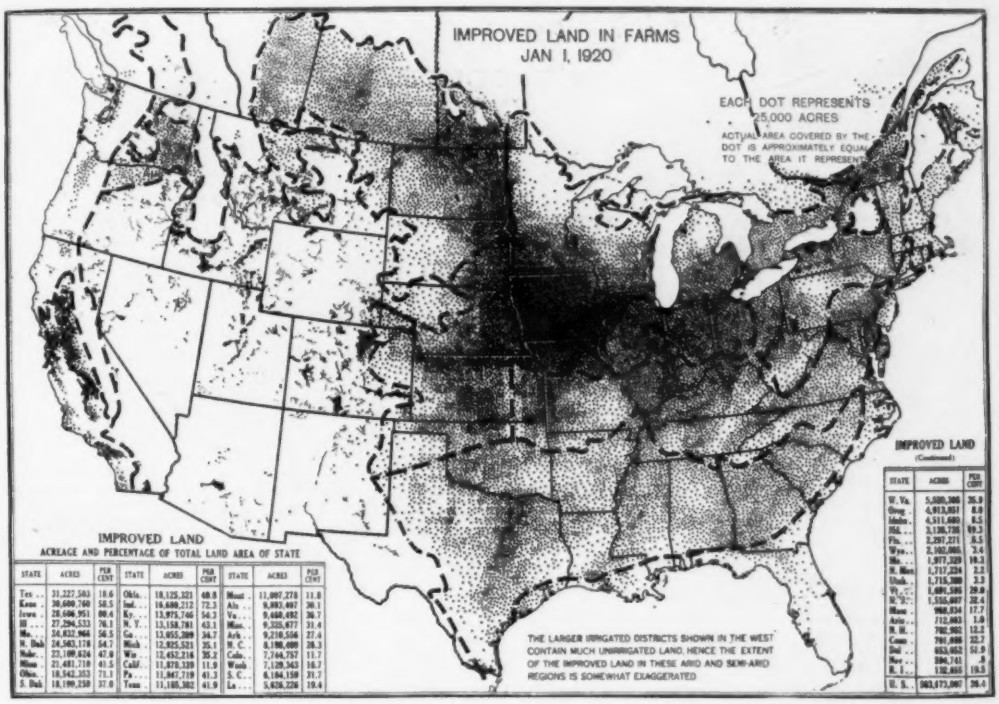
It will be noted that much of the Cotton Belt and of the Corn and Winter Wheat Belt is still largely covered with forest, but that the originally forested portion of the Corn Belt has been almost entirely cleared, also a large portion of the Hay and Dairying Region. In the North Pacific and Northern Forest and Hay regions very little clearing has taken place.

differences in the quality of his land that require specialization in utilization and management.

But within the limits of this article only the major agricultural regions can be considered, and in some regions the more important areas, or sub-regions, where great differences in degree and direction of slope, in the character of the surface, or in soils, have caused such a variation in agricultural conditions as to demand notice.

It must be added that the boundaries of the agricultural regions are not determined solely by the physical conditions of temperature, moisture, topography and soil, but are rather the result of the pressure of population against these physical conditions, which pressure varies with the stage of civilization, culture, and scientific achievement that the particular people have attained. This pressure of man upon the land exhibits more or less clearly certain economic principles, which will be noted later.

The agriculture of a country is as dependent upon the knowledge and power of the people as it is upon the qualities and characteristics of the land. The boundaries of these agricultural regions, therefore, may not all be permanent. This is no detriment, however, for nothing is permanent in the world except change; and the study of the changes in the boundaries, indeed, even of the development or dissolution of an agricultural


IMPROVED LAND IN FARMS
JAN 1, 1920
EACH DOT REPRESENTS
25,000 ACRES
ACTUAL AREA COVERED BY THE DOT IS APPROXIMATELY EQUAL TO THE AREA IT REPRESENTS
THE LARGER IRRIGATED DISTRICTS SHOWN IN THE WEST CONTAIN MUCH UNIRRIGATED LAND. HENCE THE EXTENT OF THE IMPROVED LAND IN THESE ARID AND SEMI-ARID REGIONS IS SOMEWHAT EXAGGERATED

IMPROVED LAND
ACREAGE AND PERCENTAGE OF TOTAL LAND AREA OF STATE

STATE	ACRES	PER CENT	STATE	ACRES	PER CENT	STATE	ACRES	PER CENT
Tex.	31,227,563	18.6	Ohio	18,125,321	68.8	Mont.	11,097,278	11.8
Kans.	30,600,760	58.5	Ind.	16,680,212	72.3	Ala.	9,883,407	30.1
Iowa	28,606,951	80.6	Ky.	13,975,746	54.3	Va.	9,460,492	36.7
Ill.	27,296,533	76.1	N. Y.	13,158,781	43.1	Miss.	9,325,677	31.4
Mo.	24,632,964	56.5	Ga.	12,955,209	34.7	Ark.	9,210,556	27.4
N. Dak.	24,563,178	54.7	Mich.	12,935,521	35.1	N. C.	8,198,400	28.3
Nebr.	23,109,626	47.9	Wis.	12,452,216	35.2	Colo.	7,764,757	11.7
Minn.	21,481,710	41.5	Calif.	11,878,329	11.9	Wash.	7,129,343	16.7
Okla.	18,542,353	71.1	Pa.	11,847,719	41.3	S. C.	6,138,159	31.2
S. Dak.	18,199,258	37.0	Tenn.	11,165,382	41.9	La.	5,826,226	19.4

IMPROVED LAND
(Continued)

STATE	ACRES	PER CENT
W. Va.	5,589,388	36.9
Oreg.	4,913,851	8.0
Idaho	4,511,680	8.5
Md.	3,135,735	69.3
Fla.	2,297,271	6.5
Wyo.	2,102,065	2.4
Me.	1,977,329	10.1
N. Mex.	1,717,224	2.2
Utah	1,715,388	3.3
Nev.	1,089,586	29.0
N. H.	1,555,687	32.4
Hawaii	968,834	17.7
Ariz.	712,983	1.0
R. I.	790,902	12.2
Conn.	791,488	32.7
Del.	653,653	51.9
Nev.	396,741	.8
R. I.	132,465	19.5
U. S.	863,673,867	28.4

FIGURE 11.—Improved land in the United States includes "all land regularly tilled and mowed; land in pasture that has been cleared or tilled; land lying fallow; land in gardens, orchards, vineyards, and nurseries; and land occupied by buildings, yards, and barnyards." In Canada it includes "all land which has been brought under cultivation and is fitted for producing crops, including orchards, gardens and land occupied by buildings."

In the Corn Belt over three-fourths of the land area is improved farm land, and from this center the density grades off into the Corn and Winter Wheat Region to the South, into the Hay and Dairying Region to the east and north, into the Spring Wheat Region to the northwest and the Hard Winter Wheat Region to the southwest. In the Grazing and Irrigated Crops Region most of the improved land is in the irrigated districts, and a large part also in the Pacific Subtropical Crops Region. But in the Columbia Plateau Wheat Region and the North Pacific Hay, Pasture and Forest Region there is almost no irrigation. Canada statistics are for June 1, 1921. (Map copyrighted by O. E. Baker, 1926.)

region, is likely to be one of the most fruitful in the field of economic geography.

THE FRIGID AND TROPICAL REGIONS

The frigid part of North America has practically no agriculture; its division into regions, therefore, is based on the natural vegetation, herbs, lichens (1) the dwarf woody vegetation and trailing vines of the tundra, used in Alaska for grazing reindeer, and in northern Canada by herds of wild caribou, and (2) the scrub spruce and fir forest regions are recognized. In the tropical part of North America, owing in part to the ignorance of the writer, a division into only three agricultural regions is ventured, (1) the moist warm low-altitude belts in which characteristically tropical crops are grown almost exclusively, (2) the dry warm low-altitude belts, used for grazing, with irrigated crops grown locally, and (3) the cooler, high-altitude districts in which crops characteristic of both tropical and temperate zones are produced.

With this brief mention of the frigid northern and the tropical southern parts of North America, of which the first is unimportant agriculturally, and the second requires further study, let us pass to the consideration of the eastern and western parts of temperate North America, which jointly contribute about 93 per cent of the value of the agricultural production of the continent.

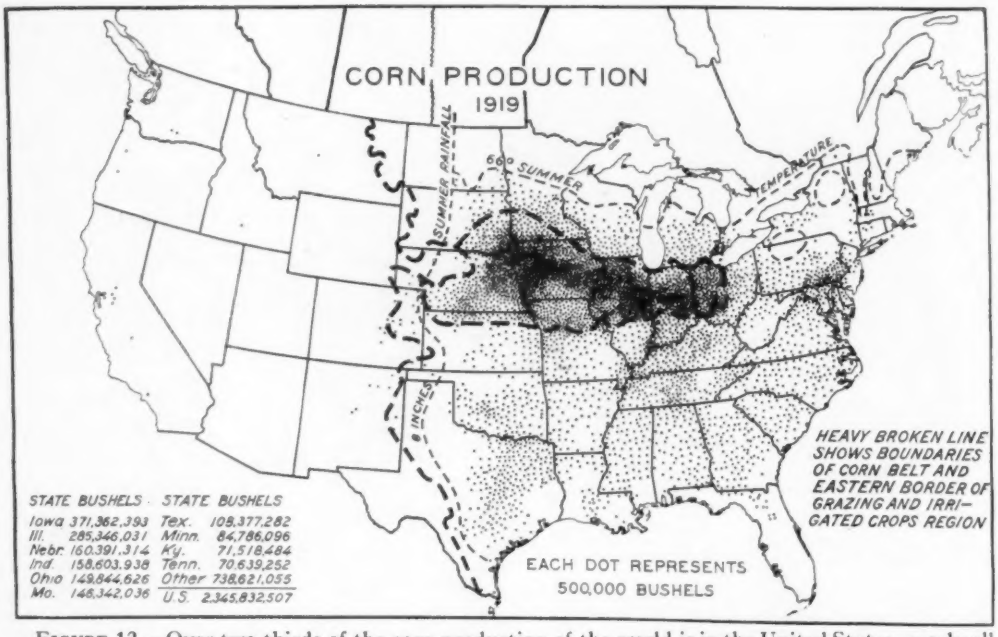


FIGURE 12.—Over two-thirds of the corn production of the world is in the United States, nearly all east of the line of 8 inches mean summer rainfall and south of the line of 66° mean summer temperature. Nearly 90 per cent of the corn production in the United States is in the Corn Belt, the Corn and Winter Wheat Region, where it leads all crops in value, and in the Cotton Belt, where it is the all-important cereal. In these three regions as a whole, corn constitutes about one-third of the acreage of all crops. In the Corn Belt it is dominant, contributing nearly two-fifths of the acreage, and half of the value of all crops. Over half of the corn produced in the United States, and over one-third of the world's crop, is grown in the Corn Belt. Hay, associated with spring oats in the northern portion and with winter wheat in the southern portion, is the other important crop in the Corn Belt. (See Figs. 16, 14, and 21.) Canada statistics are for 1920. (Map adapted from 1921 Yearbook, U. S. Dept. of Agriculture.)

THE EASTERN AND WESTERN TEMPERATE REGIONS

Throughout the eastern part of temperate North America, the rainfall is sufficient for crop production; the classification of this area into the eight regions is based largely on temperature as it affects the crops grown. In the western part rainfall is, in general, too deficient for crop production, therefore topography and the native vegetation form the basis of its classification into three regions, since the topography influences both the temperature and rainfall and the vegetation indicates their joint effect. In the East the agricultural regions extend for the most part east and west, following parallels of latitude; while in the West the regions are determined by the mountain ranges and extend north and south. Agriculture in the East varies primarily with latitude and soils, but in the West the principal factors are altitude and rainfall. The average elevation of the eastern part is less than 1,000 feet; that of the western part, over 4,000 feet. (Compare colored map with Figs. 3, 4, 5, 6 and 9.)

The eastern regions, named from south to north, are as follows: (1) the Subtropical Crops Belt, (2) the Cotton Belt, (3) the Middle Atlantic Trucking Belt, (4) the Corn and Winter Wheat Belt, (5) the Hard Winter Wheat Region, (6) the Corn Belt, (7) the Hay and Dairying Region, and, to the west of this last, (8) the Spring Wheat Region, the eastern moister portion of which, in the course of time, may be merged with the Hay and Dairying Region. North of the Hay and Dairying and Spring Wheat regions lies a frontier region, (9)

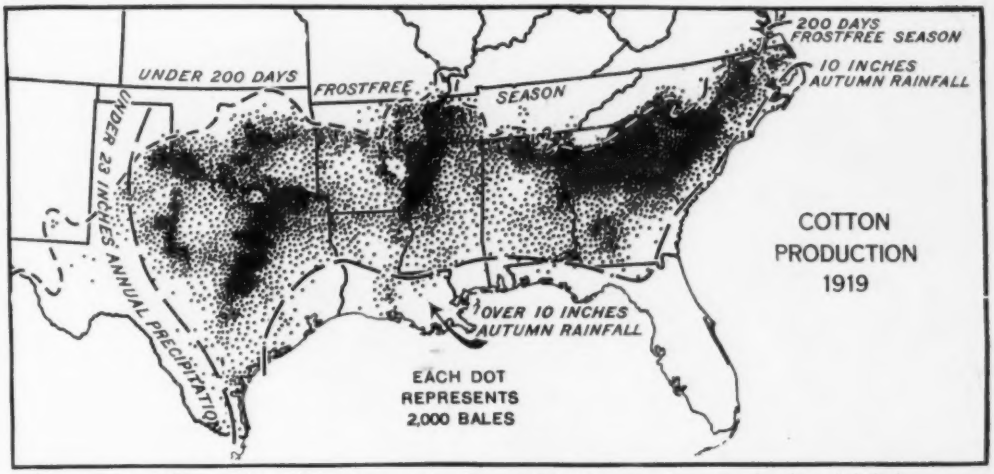
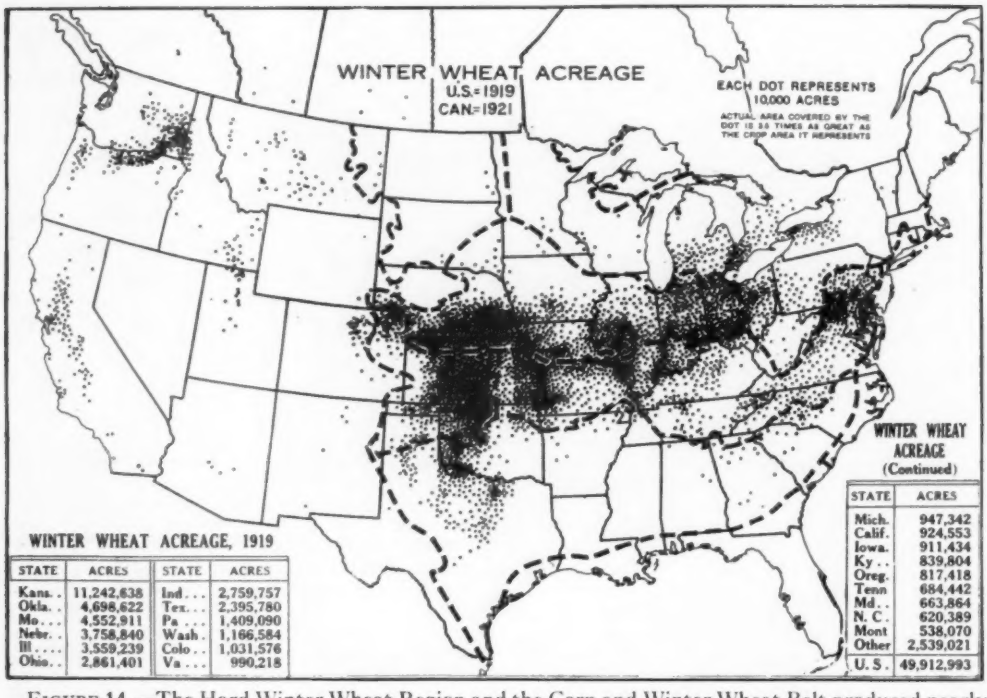

200 DAYS FROSTFREE SEASON
10 INCHES AUTUMN RAINFALL
UNDER 200 DAYS FROSTFREE SEASON
UNDER 23 INCHES ANNUAL PRECIPITATION
COTTON PRODUCTION 1919
OVER 10 INCHES AUTUMN RAINFALL
EACH DOT REPRESENTS 2,000 BALES

FIGURE 13.—The northern boundary of the Cotton Belt is approximately the line of 200 days average frost-free season (see Fig. 4) and 77° mean summer temperature; the southern boundary that of 10 inches autumn rainfall, because wet weather interferes with picking and damages the lint. This southern boundary is now moving northward, as the milder winter temperatures near the Gulf and longer season permit increased injury by the boll weevil. The western boundary of cotton production without irrigation was approximately the line of 23 inches average annual rainfall in 1919, but has now moved westward to the 20 inch line, owing to the higher price of cotton and the freedom of this dry border, with cold winters, from the boll weevil. The densest areas on the map are districts of richer soils, notably the Black Prairie of Texas and the Yazoo Delta (see Fig. 6), or heavily fertilized soils, especially those of the Piedmont and Upper Coastal Plain. (Map from article by author in "Book of Rural Life," Bellows Durham Co., Chicago, 1925.)

the Northern Forest and Hay Region, which consists mostly of rocky land covered with forests, but contains a little agricultural land, notably in the "Clay Belt" of northern Ontario and in the Peace River Valley of Alberta and British Columbia (Fig. 10). The western regions, named from east to west, are: (10) the Grazing and Irrigated Crops Region, (11) the Columbia Plateau Wheat Region, (12) the Pacific Subtropical Crops Region, and (13) the North Pacific Hay, Pasture and Forest Region, which, unlike the other western regions, has a humid climate, except in the summer months. The relative density of improved farm land in these regions is shown in Figure 11.

The Crops

In the eastern regions, considered as a whole, corn is the leading crop, constituting over one-fifth of the acreage and about one-fourth of the value of all crops. It is grown in all the eastern regions, except the Forest and Hay Region. This crop is dominant in the Corn Belt, and is very important in the Corn and Winter Wheat Region and in the Cotton Belt, but in the Hay and Dairying Region, also in the Spring Wheat Region, it is relatively unimportant, except in the southern portion (Fig. 12). Along the subtropical Gulf of Mexico and the southern Atlantic Coast the type of agriculture varies greatly from section to section—from rice farming to sugar cane growing, winter vegetable production and citrus fruit orcharding—so that the region is not named after a crop but is called the "Subtropical Crops Belt." In this eastern part of North America little cotton is grown outside the Cotton Belt (Fig. 13), very little winter wheat outside the Hard Winter Wheat Belt and the Corn and Winter Wheat Region and adjacent portions of the Corn Belt and Cotton Belt (Fig. 14) and practically no spring wheat outside the Spring Wheat Region (Fig. 15). Grass is of greatest importance in the Hay and Dairying Region, where in nearly every county hay and pasture occupy half or more of the im-



WINTER WHEAT ACREAGE, 1919

STATE	ACRES	STATE	ACRES
Kans.	11,242,638	Ind.	2,759,757
Okla.	4,698,622	Tex.	2,395,780
Mo.	4,552,911	Pa.	1,409,090
Nebr.	3,758,840	Wash.	1,166,584
Ill.	3,559,239	Colo.	1,031,576
Ohio.	2,861,401	Va.	990,218

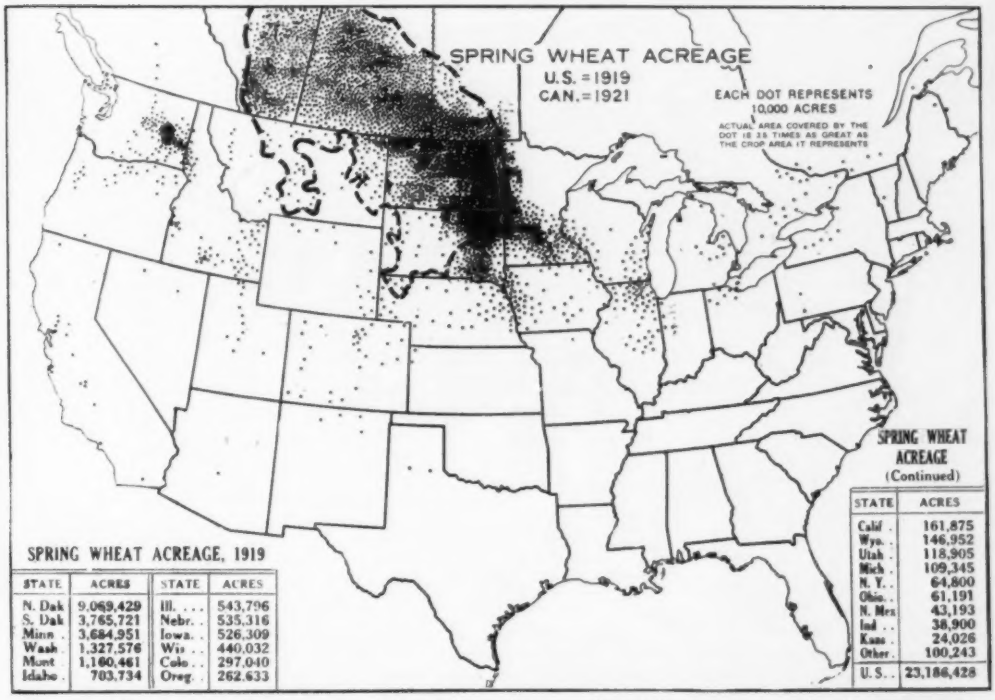
FIGURE 14.—The Hard Winter Wheat Region and the Corn and Winter Wheat Belt produced nearly 50 per cent of the nation's crop of winter wheat in 1919, and 30 per cent more was produced in the southern and eastern portion of the Corn Belt. The southern boundary of this winter wheat belt from Oklahoma eastward follows the isotherm of 72° during the month preceding harvest (June 15); and although some wheat is grown south of this line, it frequently suffers severe damage from rust. The northern frontier of winter wheat follows, in a general way, the mean winter temperature line of 20°, which extends in a northwesterly direction from northern Illinois and Iowa diagonally across South Dakota and Montana. In the Columbia Plateau Wheat Region, the winter wheat is grown mostly in the moister portion. (Map copyrighted by O. E. Baker, 1926.)

proved land (Fig. 16). In this region timothy and clover, grown separately or mixed, are the dominant hay crops (Fig. 17); whereas in the drier climate of the Spring Wheat Region wild hay is dominant (Fig. 18).

In the western regions as a whole, hay is the leading crop, contributing nearly two-fifths of the acreage and over one-fourth of the value of all crops (Fig. 16), and the forage obtained from grazing is of even greater value. Alfalfa is the principal hay crop in most of the Grazing and Irrigated Crops Region (Fig.19), and grains cut green in most counties along the Pacific Coast (Fig. 20). In this western part of North America, excluding Mexico, fruits and nuts contributed 28 per cent of the value of all crops, wheat 18 per cent, potatoes 5 per cent, other vegetables 4 per cent, barley 3 per cent, and oats 2 per cent in 1919. The value of all crops in the four western regions, however, constituted in 1919 only 9 per cent of the total for the United States and Canada. The value of the pasturage in the western regions is almost equal to that of all the crops.

Livestock

The contrast between the East and West is not as pronounced in livestock as in crops, except that swine are largely confined to the East because they require grain, while sheep, which can subsist wholly by grazing, are much more important in the West (Figs. 21 and 22). There is a marked distinction, however, in the management, the livestock in the East being fed in the barnyards or fields with shelter at night, while in the West the stock is mostly


SPRING WHEAT ACREAGE
U.S.=1919
CAN.=1921
EACH DOT REPRESENTS 10,000 ACRES
ACTUAL AREA COVERED BY THE DOT IS 25 TIMES AS GREAT AS THE CROP AREA IT REPRESENTS
SPRING WHEAT ACREAGE, 1919
SPRING WHEAT ACREAGE (Continued)

STATE	ACRES	STATE	ACRES
N. Dak	9,069,429	Ill.	543,796
S. Dak	3,765,721	Nebr.	535,316
Minn.	3,684,951	Iowa.	526,309
Wash.	1,327,576	Wis.	440,032
Mont.	1,160,461	Colo.	297,040
Idaho	703,734	Oreg.	262,633

STATE	ACRES
Calif.	161,875
Wyo.	146,952
Utah	118,905
Mich.	109,345
N. Y.	64,800
Ohio.	61,191
N. Mex	43,193
Ind.	38,900
Kans.	24,026
Other	100,243
U. S.	23,186,428

FIGURE 15.—Almost 90 per cent of the spring wheat produced in North America is grown in the Spring Wheat Area, where it constitutes nearly half of the acreage of all crops. A secondary but important center of production is located in the Columbia Plateau Wheat Region of eastern Washington and Oregon. The southern boundary of the Spring Wheat Area is determined largely by the northern boundary of winter wheat, which is, in general, more productive and more profitable where it can be grown. The northern limit of spring wheat is approximately the mean summer temperature of 58°, which is found in the United States only in the western mountains, and in Canada about 200 miles north of the northern boundary of the Spring Wheat Region, or almost at the northern border of the Hay and Forest Region. (Map copyrighted by O. E. Baker, 1926.)

grazed on the open range. In the East, the Hay and Dairying Region is primarily a dairy area (Fig. 23); while the Corn Belt is the center of the beef-cattle and swine industry (Fig. 24). In the West, the sheep are generally located in the more arid and the cattle in the less arid areas; while in the North Pacific Region, with its cool, moist climate, similar to that of the Hay and Dairy Region, dairying is again the dominant livestock industry.

Reducing the several kinds of farm animals to animal units equivalent to the horse, cow, or mature steer, there were, on January 1, 1920, about 94 units per square mile in the Corn Belt, 48 in the humid eastern half of the United States taken as a whole, 24 in the semi-arid portions of the Spring Wheat Region, Hard Winter Wheat Region and Cotton Belt, considered jointly, and 12 on the average in the three regions lying to the west. Although these four western regions include over one-third of the land area of the United States, they possess only about 10 per cent of the animal units in the nation. Fully 80 per cent of the land in these western regions is pasture and range, mostly of low carrying capacity, and only 3½ per cent of that portion within the United States is in crops. In the Canadian portion both livestock and crops are almost insignificant.

Systems of Farming

The methods of combining the crops and livestock into systems of farming are different in the East from those in

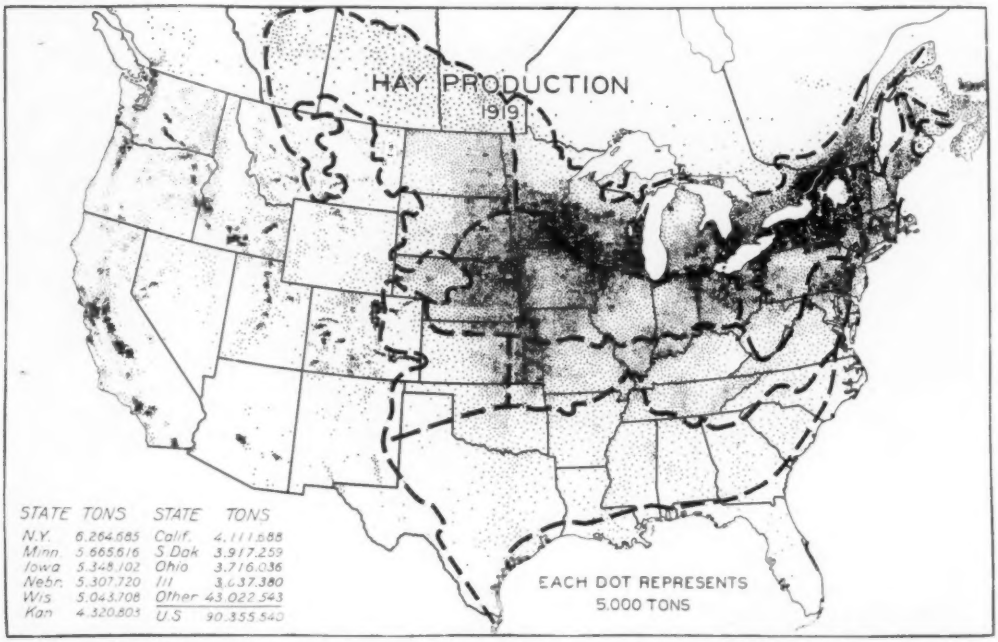


FIGURE 16.—The production of hay is greatest in the Hay and Dairying Region, in the western Corn Belt, and in the irrigated valleys of the West. New York leads all States and Provinces in production, followed by Minnesota, Iowa, Nebraska, Wisconsin, and Kansas. These estates produce one-third of the entire hay crop of the United States. California, South Dakota, and Ohio also rank above Ontario and Quebec in the production of hay. However, hay is of greatest importance compared with other crops in the Forest and Hay Region of Canada, where it constitutes almost 90 per cent of the acreage of all crops. Canada statistics are for 1920. (Map copyrighted by O. E. Baker 1926.)

the West, principally with respect to the importance of pasturage. In the East, as already indicated, crops generally supply the major portion of the feed for livestock, whereas in the West pasture supplies most of the sustenance. Two exceptions to this general statement must be noted in the East and two in the West. In the Subtropical Crops Belt much of the feed for livestock is derived from grazing in the open pine woods, and in the Hay and Dairying Region, far to the north, the cows depend largely on pasture during the six months' warm season. Likewise in the irrigated districts of the Grazing and Irrigated Crops Region and of the South Pacific Region the livestock are fed largely on hay and the small grains, whereas in the North Pacific Region, with its moister climate, the dairy cows depend largely on pasture for their sustenance.

In both the East and the West, crops are much more important than livestock in the southern portions, notably in the Cotton Belt and in the South Pacific Region. The importance of livestock generally increases toward the north, owing in large part to the better pasturage and the need of farm enterprises that will afford winter employment, until in most of the Hay and Dairying Region and in the North Pacific Region the production of milk becomes the principal farm enterprise, often supplemented by the feeding of a few hogs.

Size of Farms

The farms, or "ranches," in the West are, in general, much larger in area than in the East. Owing to the low rainfall in the West, except in the North Pacific Region, the land outside the irrigated and dry-farming districts, as already noted, is used mostly for grazing, and instead of 80 to 160 acres being sufficient to support a family, as in the East, 2,000 to 4,000 acres or more are com-

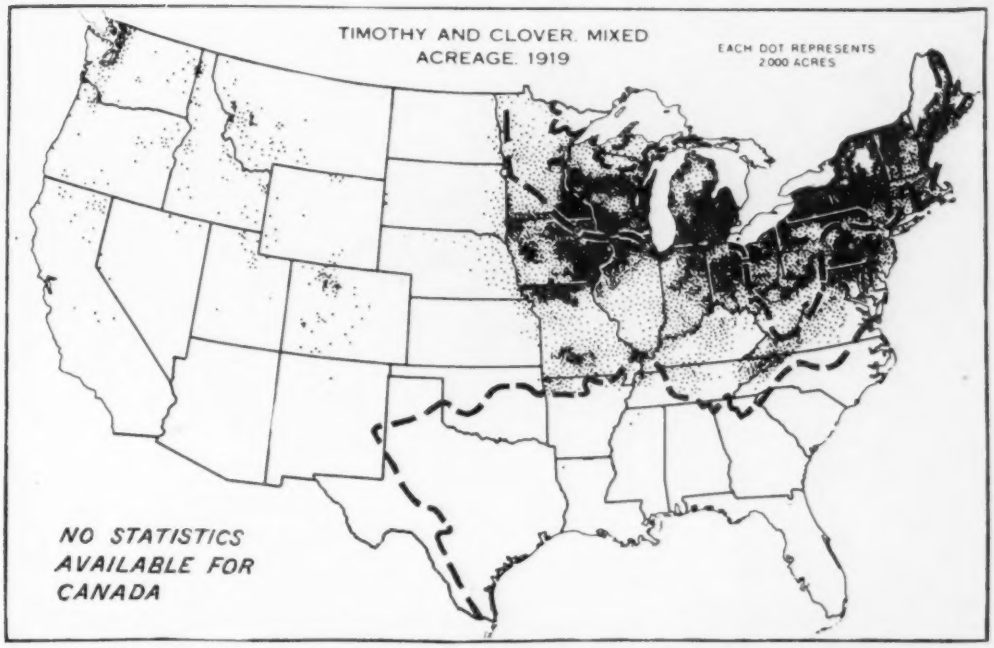


FIGURE 17.—Timothy, grown separately or mixed with clover, is the characteristic and dominant hay crop of most of the Hay and Dairying Region, also of the Corn Belt east of the Missouri River and of the Corn and Winter Wheat Belt, especially the northern portion. In the southern portion of the Corn and Winter Wheat Belt the annual legumes, particularly cow peas, and several grasses, especially orchard grass and red top, become important. Nevertheless, timothy and clover are the leading hay plants as far south as the northern margin of the Cotton Belt. The western margin of timothy and clover in the Dakotas, Nebraska and Kansas marks the beginning of the sub-humid "Black Earth" Belt (Fig. 6), where lime has accumulated in the subsoil, and where alfalfa becomes dominant in the central portion and wild hay in the northern. The summer rainfall along this western margin increases from 10 inches at the Canadian border to 12 inches in eastern Kansas. (Adapted from map in 1921 Yearbook, U. S. Dept. of Agriculture.)

monly required. In the dry-farming areas half sections of land (320 acres) and sections (640 acres) are normal size farms. In the irrigated districts the farms are no larger in area than in the East. The 80- or 120-acre irrigated farm, however, is often worth as much as the 640-acre dry farm or the 3,000-acre stock ranch. (See Figs. 25 to 28.)

Farm Tenure

A larger proportion of the farms in the West are operated by their owners than in the East, owing, doubtless, to the cattle ranching, which industry requires more capital than a tenant usually possesses, the more recent homestead settlement, and the larger proportion of fruit farms, the care of which can seldom be entrusted with safety to a tenant. The proportion of farms operated by tenants in the western regions ranges from 16 to 21 per cent; whereas in the East over 30 per cent of the farms in the Corn and Winter Wheat Region are operated by tenants, in the Corn Belt over 40 per cent, and in the Cotton Belt over 60 per cent, owing in part to the plantation system and the large negro population. The Subtropical Crops Belt, however, has only 27 per cent, and the United States portion of the Spring Wheat and the Hay and Dairying Regions have only 25 per cent and 16 per cent, respectively, of the farms rented to tenants. In the Canadian portion of the Spring Wheat Region only 11 per cent of the farms are operated by tenants, and in the Canadian portion of the Hay and Dairying Region only 4 per cent. (See Figs. 30 and 32.)

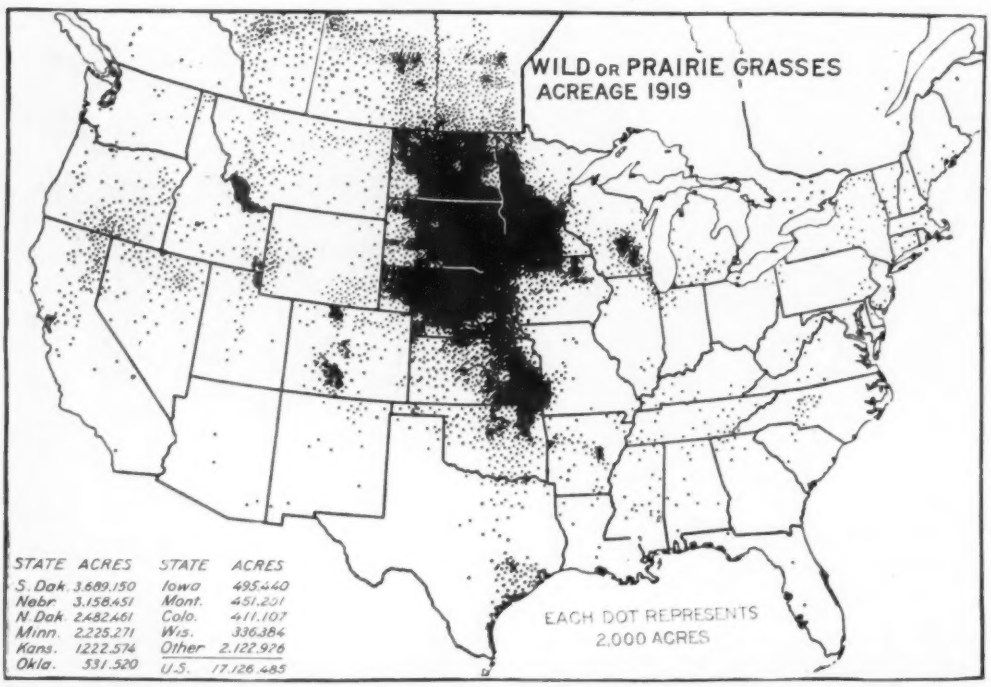


FIGURE 18.—Wild or prairie hay is found mostly in the Spring Wheat Region and in the western portion of the Corn Belt and Corn and Winter Wheat Region, in brief, in the northern part of the subhumid belt extending over, in Minnesota and Kansas especially, into the humid prairie region along its eastern margin. East of this belt the moister climate permits the cultivation of timothy and clover, which are more productive; and west of this belt the climate is so dry that the grasses normally do not grow high enough to cut (see Figs. 3 and 6). The acreage shown in Wisconsin is mostly marsh hay and that in the Western States is located largely in moist mountain valleys and "parks", or on higher plateaus. (See Fig. 5.) Canada statistics are for June 1, 1921. (Map copyrighted by O. E. Baker, 1926.)

The People

The geographic distribution of the rural and urban population is particularly interesting. The rural population is densest in the Cotton Belt, where cotton cultivation and picking require large amounts of hand labor and the acreage per laborer is consequently small; also in the eastern portion of the Corn and Winter Wheat Region, where the rolling to hilly lands and lack of capital discourage extensive use of machinery. The rural population is much thinner in the Corn Belt and the Spring Wheat Region, and is thinnest in the West, except in the irrigated districts and the Pacific coast valleys. Urban population, on the other hand, is concentrated largely in the Hay and Dairying Region of the Northeastern and Lake States and Provinces, where large manufacturing and commercial cities provide a vast market for the agricultural products from the West and South. (See Figs. 34 and 35.)

Conveniences of Farm Life

Information concerning "farm facilities," including tractors, automobiles, and telephones, was collected by the United States Census in 1920 for the first time, and by the Canadian Census in 1921. Tractors were found mostly in the Corn Belt, the Spring Wheat, and South Pacific Regions. Over one-third of the automobiles on farms in North America were in the Corn Belt, where from one-half of the farms in some states to three-fourths of the farms in other states had such vehicles. Water had been piped into the houses mostly in the Hay and Dairying Region, especially in New England, and in the South Pacific

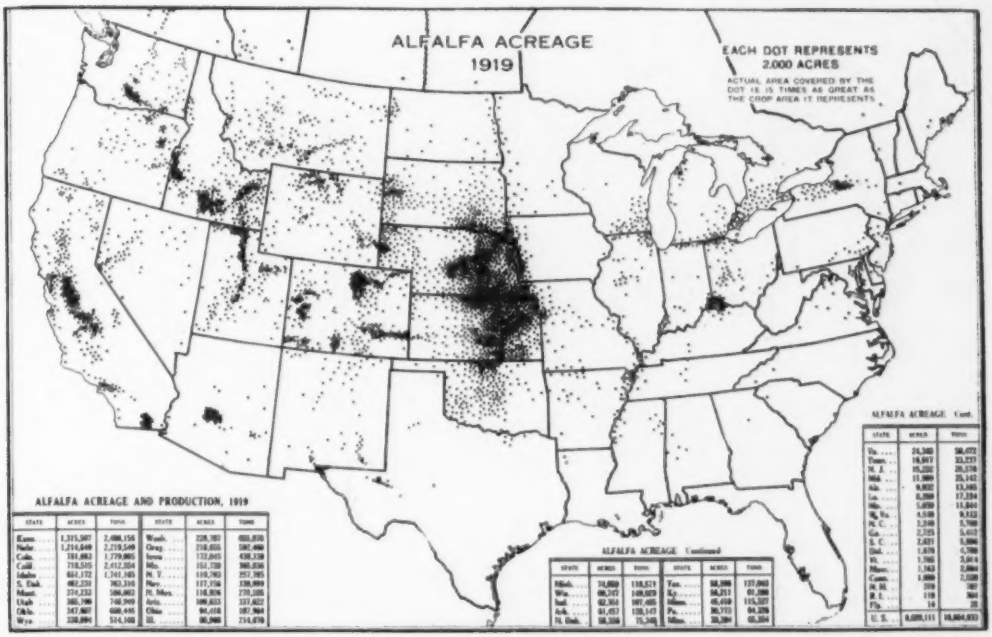

ALFALFA ACREAGE
1919
EACH DOT REPRESENTS
2,000 ACRES
ACTUAL AREA COVERED BY THE DOT IS 15 TIMES AS GREAT AS THE CROP AREA IT REPRESENTS
ALFALFA ACREAGE AND PRODUCTION, 1919
ALFALFA ACREAGE Continued
ALFALFA ACREAGE Cont.

FIGURE 19.—Alfalfa demands soils that are not acid, and it is most easily cured in a climate that is not rainy during the summer. Consequently, it thrives best in the Grazing and Irrigated Crops Region and the Pacific Sub-tropical Crops Region where it is grown mostly under irrigation. Alfalfa grows fairly well in the limestone sections of the East, where its culture is increasing rapidly. This increase has been notable in the slightly sub-humid section of eastern Kansas and Nebraska, where the acreage has increased over sixfold in the past 20 years. Alfalfa replaces wild hay in this area as the major hay crop. Alfalfa acreage is increasing also in the eastern Corn Belt, and in the limestone areas of the Hay and Dairying Region. However, seven-eighths of the alfalfa acreage is still located west of the Missouri River. Canada statistics are for 1920. (Map adapted from 1921 Yearbook, U. S. Dept. of Agriculture.)

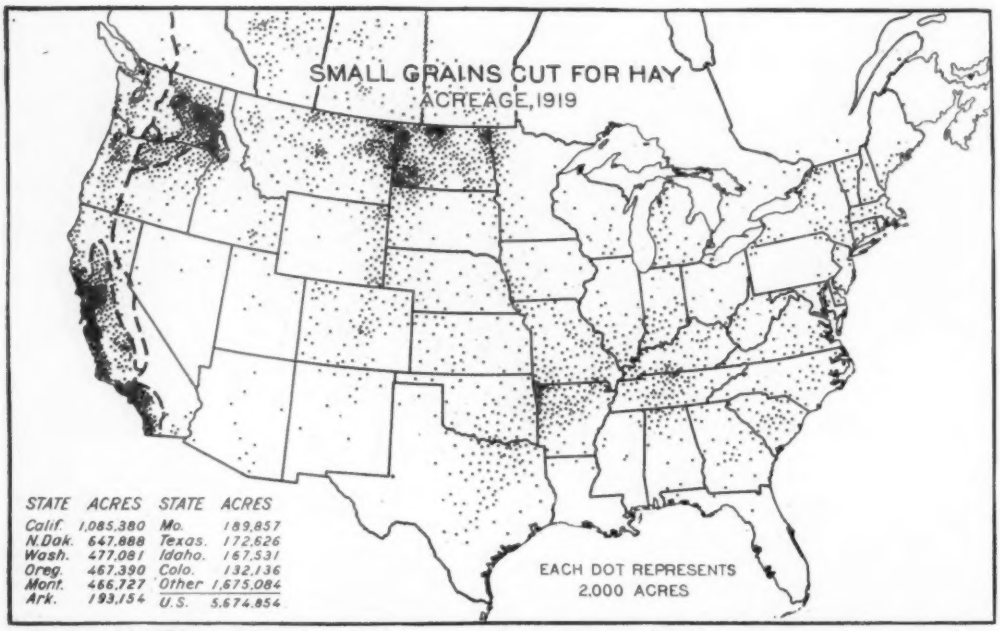
Region. Telephones were more widely distributed than any other of the farm facilities; nevertheless, the map shows a noteworthy concentration in the Corn Belt and the Hay and Dairying Regions. These "farm facilities" are criteria of rural progress and prosperity, and as such their geographic distribution is deserving of consideration. (See Figs. 36 to 39.)

THE ECONOMIC PRINCIPLES

Although the physical conditions of temperature, moisture, topography and soil are fundamental in determining the crops grown and the consequent division of North America into agricultural regions, there are several economic forces which strengthen the influences of the physical factors and which it is helpful to keep in mind in considering the characteristics of each of these agricultural regions.

1. The more fertile or favorably situated land tends to be used for the more productive crop; that is, land having optimum temperature and moisture conditions, level or gently rolling surface, rich soil, and good transportation facilities tends to be used for the crop that yields the larger quantity of food or the greater value of products per acre. Normally this greater value is associated with greater intensity of cultivation. Moreover, as population increases and land becomes relatively scarcer this tendency becomes stronger, since the more expensive land and more abundant labor must be most profitably employed.

Near the large cities, for instance, market gardening is commonly the most important system of farming, especially if fertility of soil is combined with favor-



STATE	ACRES	STATE	ACRES
Calif.	1,085,380	Mo.	189,857
N.Dak.	647,888	Texas.	172,626
Wash.	477,081	Idaho.	167,531
Oreg.	467,390	Colo.	132,136
Mont.	466,727	Other	1,675,084
Ark.	193,154	U.S.	5,674,854

FIGURE 20.—The small grains—barley, oats, wheat, and occasionally rye—are cut green for hay mostly in the Pacific Coast States, where a hay crop is needed which will grow quickly during the cool, moist winters, and which need not survive the long summer drought. In California barley mostly is used, but in Washington and Oregon wheat and oats are more commonly cut for hay. The large acreage shown in North Dakota, eastern Montana and the Columbia Plateau Wheat Region of eastern Washington and Oregon is mostly wheat, and is doubtless larger than usual owing to the dry season which caused much of the crop in these areas to be scarcely worth threshing. Canada statistics are for 1920. (Adapted from map in 1921 Yearbook, U. S. Department of Agriculture.)

able location.[2] Outside the trucking and fruit regions, cotton and corn occupy the most expensive land. Corn, which under favorable conditions probably yields more food per acre than any other crop grown in the United States, preëmpts the best land within its climatic range, except as hereafter noted, to such an extent that it is called the "Corn Belt." But when a crop requiring still greater intensity of cultivation and yielding products of greater value per acre, such as cotton, enters into competition for the use of the land, corn descends into a subordinate place, and we have another region called the "Cotton Belt." Wheat ranks next to corn in productivity per acre, so, other things being equal, it has fourth choice of the land. The great wheat producing regions are found between the Cotton Belt and the Corn Belt (in fact, almost entirely surround the Corn Belt) and in the sub-humid and semi-arid lands to the west and northwest. Where wheat does not succeed, oats are grown, provided the climate is sufficiently moist, and where neither wheat nor oats can be profitably produced, as on sandy soils, rye is grown. Beyond, far to the north, in the semi-arid regions of the West, and along the moist North Pacific and North Atlantic Coasts, where the physical conditions are unfavorable to most other crops, and land is cheap, hay is dominant. Where the climate is too dry for hay, as in the deserts of the West, the land is used for pasture, and where it is too cold, as in the far North, or the land is steep or stony, the hay crop gives way to forest. Now, the average farm values per acre of these crops in the United States during the pre-war period, 1909–1913, were as

[2] The explanation of this principle and statement of the succeeding principles is taken from "The Potential Supply of Wheat," by the author, ECONOMIC GEOGRAPHY, March 1925, which see for the application of these principles to a single crop.

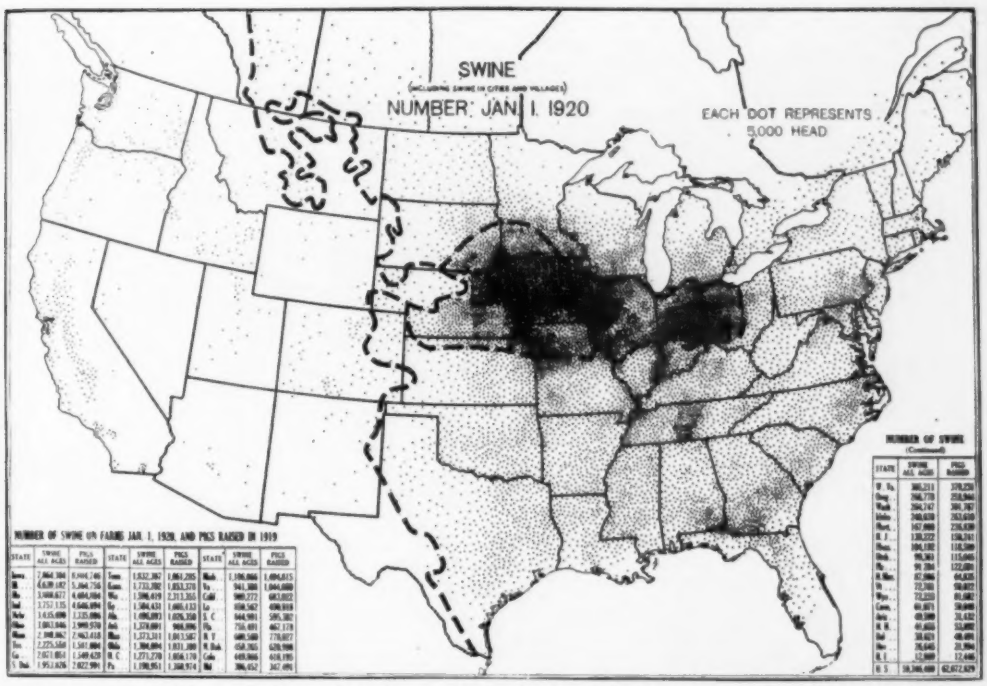


FIGURE 21.—About two-fifths of the hogs and pigs in the United States and Canada are in the Corn Belt, which is shown in outline on the map, nearly one-fifth are in the Cotton Belt, and nearly another fifth in the Corn and Winter Wheat Region. In 1919 there were, on the average, 106 swine per square mile in the Corn Belt, 33 in the Corn and Winter Wheat Region, 27 in the Cotton Belt, 17 in the Hay and Dairying Region, and about 4 per square mile in the remainder of the United States. Just as the cool Hay and Dairying Region finds the best outlet for its crops in feeding dairy cows, so the warm, rich Corn Belt finds the growing of corn and feeding of beef cattle and hogs its most profitable system of farming (see Figs. 12 and 24.) The small number of swine in the western regions (west of the dashed line) should be noted. Swine in cities and villages numbered 2, 638, 389, which is about 4 per cent of the total number in the United States. Canada statistics are for June 1, 1921. (Map copyrighted by O. E. Baker, 1926.)

follows: tomatoes, $120.00, potatoes $59.00, cotton $22.76, corn $14.72, wheat $12.56, oats $11.51, rye $11.44, tame hay in the marginal regions about $10.00 and wild hay $6.75. The average rental value of the pastures of the United States was not more than $1.00 per acre, and the value of the annual growth of our forests was probably still less per acre.

2. Correlated with this tendency to utilize the most productive land in the most productive way is the principle that the crop or other agricultural product which is most limited in climatic or other physical requirements of production will, if the demand for it be sufficient, have first choice of the land. It possesses, so to speak, a sort of natural monopoly and consequently commands a price which gives it an advantage over other crops or products.

Wheat, for instance, can be grown in portions of the Cotton Belt, but very little is produced, not only because cotton is a more productive crop, but also because cotton has narrower climatic requirements than wheat and these are met more fully in the Cotton Belt than elsewhere in the United States, or, perhaps, in the world. Wheat can be grown from the Cotton Belt northward almost to Hudson Bay and the Mackenzie Valley, from the Piedmont Plateau on the east to the Rocky Mountains on the west, and locally almost to the Pacific Coast; but the cotton crop is restricted commercially to those parts of the United States having over 200 days in the frost-free season, a summer tem-

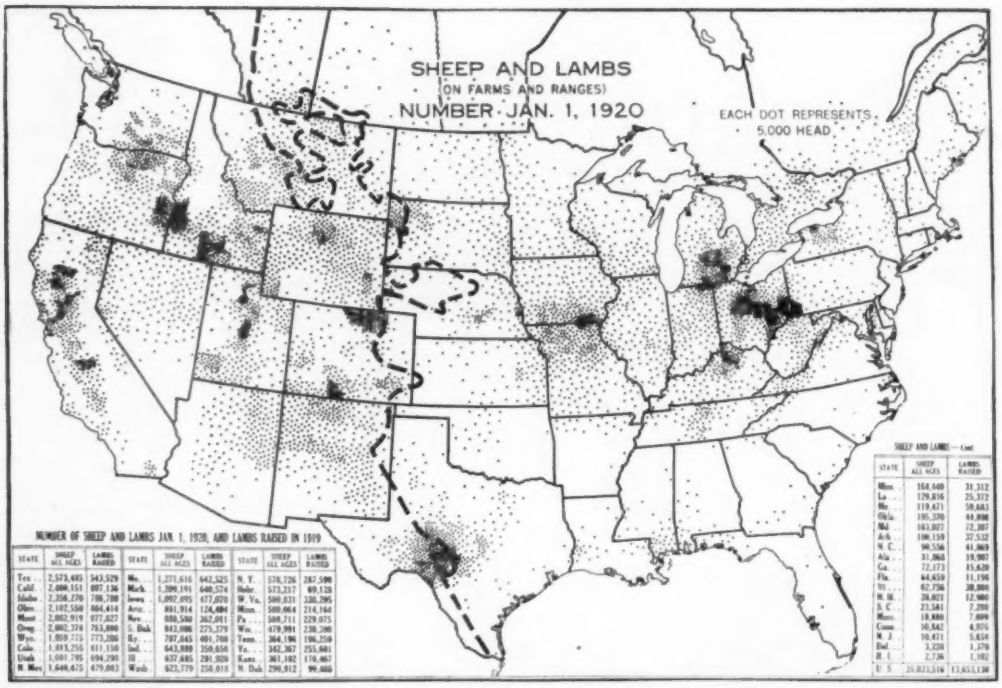


FIGURE 22.—Over 60 per cent of the sheep and lambs in the United States and Canada are in the western regions (west of the heavy dashed line), largely because sheep can graze on more arid lands than any other kind of domesticated animal, and also are less subject to disease in arid than in humid climates. The dense spots shown in the West are owing in part to the date of enumeration in the United States, January 1, when many sheep are being fed in the irrigated districts, and in part to the enumeration of sheep in that county in which the owner resides, even though the bands of sheep be roaming over distant deserts. The following summer the same sheep may graze on the alpine meadows of the national forests an hundred miles or more away. The dense centers in the East, however, represent sheep on farms within the counties indicated. Most of these counties contain rough or hilly pasture land, but in southern Michigan and western New York the presence of sheep is owing largely to the bean straw and silage which provides cheap feed. Canada statistics are for June 1, 1921. (Map copyrighted by O. E. Baker, 1926.)

perature of 77 degrees or more, not less than 20 inches of average annual precipitation, and not more than 10 inches of rain in the three autumn months, since rainy weather at this season interferes with picking and damages or discolors the lint.

The area in the United States physically available for cotton is only about 40 per cent of that available for wheat; and in the world the areas producing cotton are, as compared with many other crops, relatively small in extent, about 60 per cent of the world's crop being grown in our Cotton Belt. Consequently, the price of cotton is normally such, largely as a result of its narrower climatic limits, that only enough corn is grown in the Cotton Belt to meet the local demand, for reasons which will be explained under economic principle No. 3, and practically all the wheat flour is imported from the North and West. Corn, like wheat, has a wider climatic range than cotton and can be grown elsewhere.

But corn has a narrower climatic range than wheat and tends to exclude wheat from the Corn Belt, except in so far as wheat can be grown with labor not needed at that particular season for corn, as explained under economic principle No. 4. Wheat is grown extensively in many countries, especially on the sub-humid lands that occupy so large a part of the earth's surface; whereas the production of corn is climatically confined to a few areas, two-thirds of

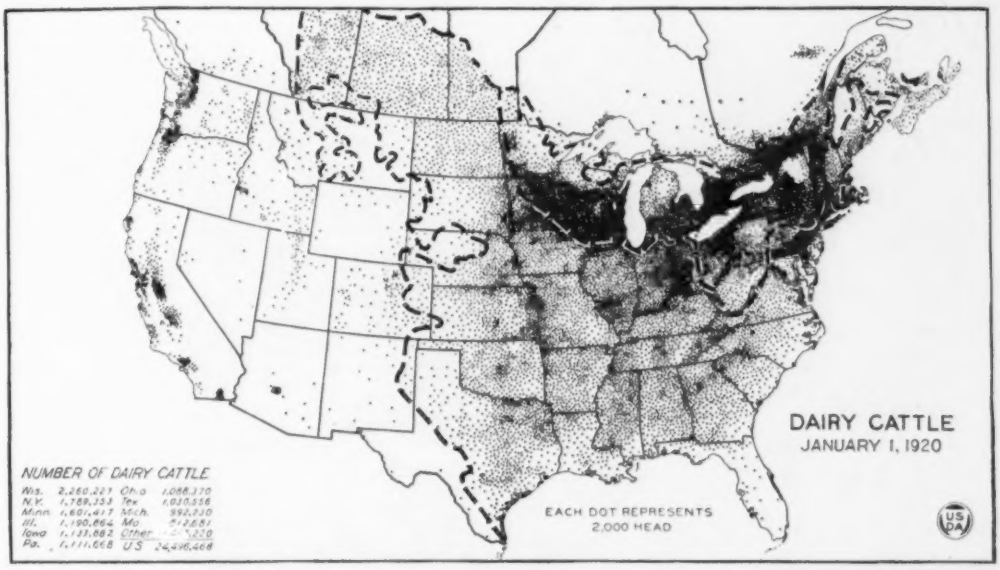


FIGURE 23.—Nine-tenths of the dairy cattle are in the eastern regions, about half are in the Hay and Dairying R ion and the adjacent northern and eastern margin of the Corn Belt, where hay and pasture are abu..dant and corn is generally grown both for grain and silage. Dairying also provides work during the long winters, and the cool climate promotes a high quality of milk. Another important factor is the location within this Hay and Dairying region of over half the urban population, who need fresh milk daily.

Other dense areas of dairy cattle will be noted in southeastern Pennsylvania, which is really Corn Belt country, and in the valleys of the North and South Pacific regions. In the Cotton Belt, especially the southern margin, dairy cattle are much less numerous. In the northern portion of the Belt they are, however, much more numerous than beef cattle. In the Subtropical Crops Belt and the Grazing and Irrigated Crops Region, on the other hand, beef cattle are more important. The dairy cattle in cities and villages number 1,220, 564, which is less than 4 per cent of all dairy cattle and calves in the United States. Canada statistics are for June 1, 1921. (Map copyrighted by O. E. Baker, 1926.)

the world's production being grown in the eastern United States, and half of this two-thirds in the Corn Belt.

3. The crop or other agricultural product which has small bulk or weight per unit of value can best bear the cost of transportation and will be grown, consequently, in those regions offering the most favorable physical conditions; but not to the exclusion of more bulky crops, because a certain quantity of these bulky crops that cannot bear the cost of transportation must be grown locally to meet the local demand.

Cotton, for instance, of which the farm price during recent years has been 15 to 30 cents a pound, can be shipped to England or New England at a cost normally of 1.5 to 3 cents, or about 10 per cent of its value, of which 5 per cent is for freight and 5 per cent for commissions, storage and other market charges. Corn, on the other hand, of which the farm price in the Corn Belt in recent years has ranged from a ½ a cent to 2 cents a pound, costs on the average about 100 per cent of its value to ship to the Cotton Belt; that is, when the farm price of corn is 50 cents a bushel in Iowa or Nebraska it is usually about $1.00 in Georgia and Texas. The Cotton Belt normally imports corn and the price, therefore, is determined by the Corn Belt price plus the cost of transportation.

The Cotton Belt farmer finds it profitable, owing to this protection, to grow nearly enough corn to meet the local demand, but when he grows more than enough he finds it very unprofitable, as occurred in Georgia in 1921. The average farm price for the state in that year dropped to 53 cents as compared with 74 cents in South Carolina and 78 cents

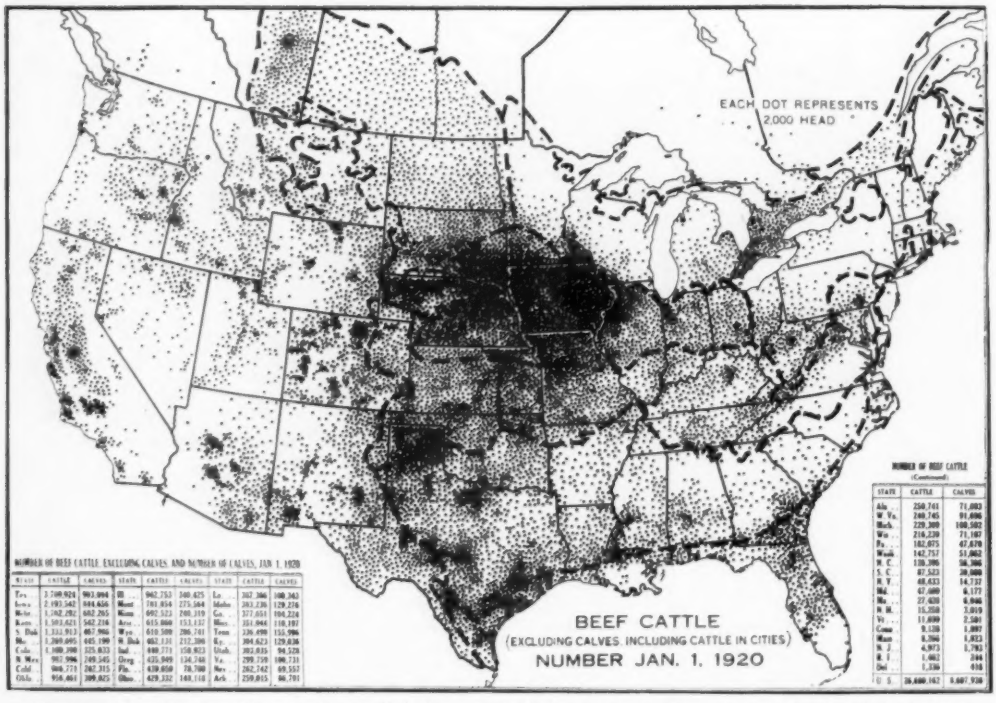
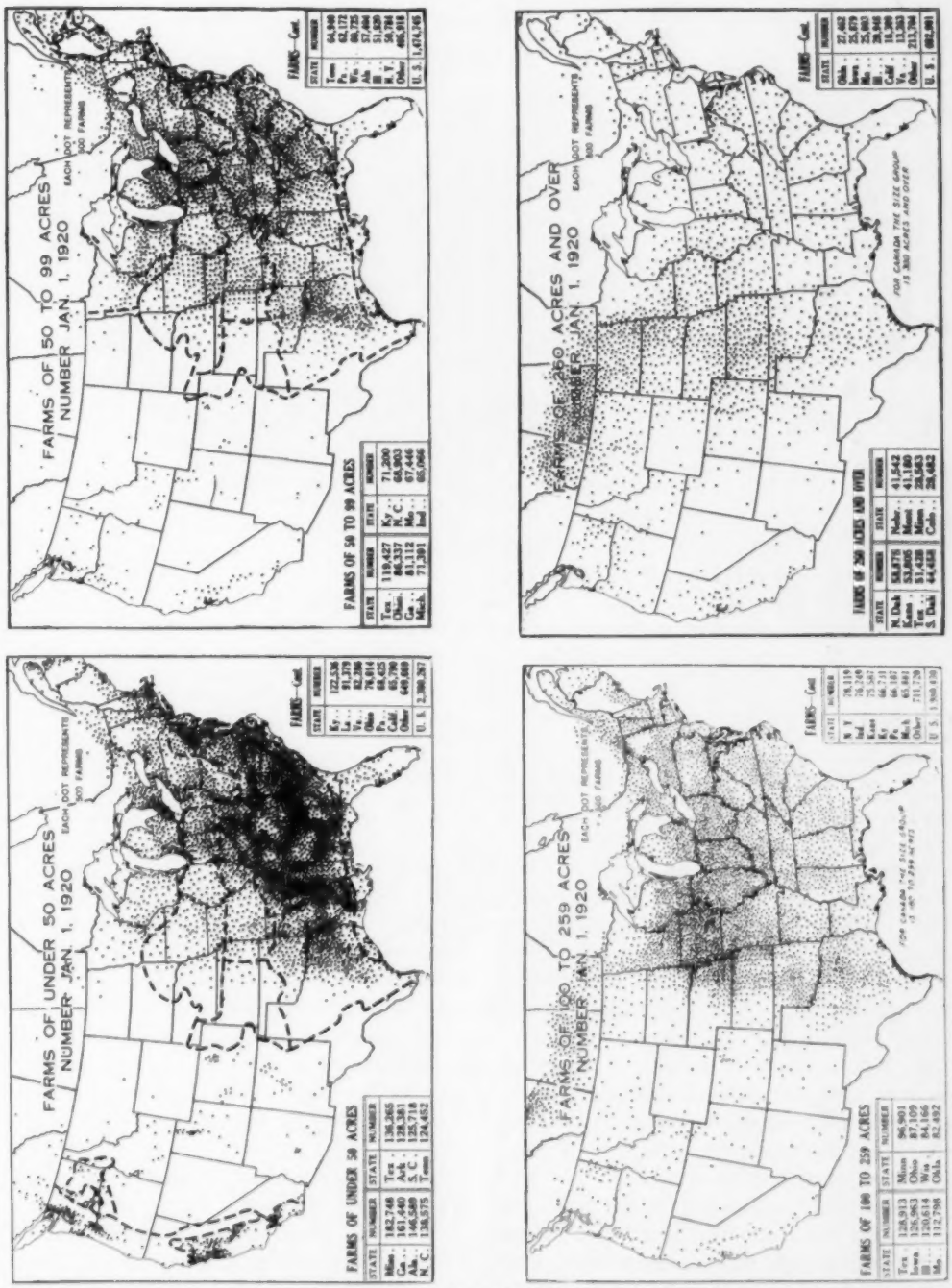


FIGURE 24.—Beef cattle constitute slightly over half the total number of cattle in the United States, but slightly less than half the value. Over 8 million beef cattle (including calves) are in the Corn Belt, and even more are in the Grazing and Irrigated Crops Region, these two regions having about half the beef cattle in the United States and Canada. The young stock can be raised most cheaply on the pasture lands of the Grazing Region, but fattened most cheaply on the corn of the Corn Belt. So "stockers" and "feeders" are shipped in vast numbers from the Grazing or "Range" Region to the Corn Belt, and then, after fattening, to the big "packing" centers for slaughter, from which the meat is shipped to the Eastern cities in refrigerator cars, a distance averaging over 1,500 miles in all. A large number of beef cattle will also be noted in the Subtropical Crops Belt and in the southern portion of the Cotton Belt, in the Appalachian valleys, and in the Pacific Subtropical Region. These are, for the most part, consumed locally. The corner table gives figures of beef cattle and of calves on farms only; there were 890,963 in cities and villages. Canada statistics are for June 1, 1921. (Map copyrighted by O. E. Baker, 1926.)

in North Carolina. The price in Georgia would have been still lower if Georgia had not been able to sell part of its surplus to these states. If Georgia had been compelled to ship corn to the Corn Belt, it would have received almost nothing for its corn.

But it does not normally pay the Cotton Belt farmer to grow wheat even for home use, partly because the price of wheat is usually 50 per cent greater than the price of corn and freight charges are no higher. And if flour be imported, as is actually the case, the proportionate protection afforded the wheat grower in the Cotton Belt by freight charges is still smaller. The Cotton Belt, in other words, can better afford to import wheat than corn, and does so.

4. The varying seasonal requirements of the several crops and agricultural products for labor tend to diversify the agriculture of a region. The farmer must do a particular task at a definite time in the year, and he is likely to have more work than he can do at certain seasons; for instance, at planting time in the spring and harvesting time in the fall. If he can grow a crop like wheat, for example, which in the southern portion of the Corn Belt can be seeded in the fall after the corn crop is removed and harvested in the summer after corn cultivation is over and before haying


FARMS OF 50 TO 99 ACRES
NUMBER JAN. 1, 1920
EACH DOT REPRESENTS 500 FARMS
FARMS OF 50 TO 99 ACRES
FARMS OF 100 TO 259 ACRES
NUMBER JAN. 1, 1920
FARMS OF 100 TO 259 ACRES
FARMS OF 260 ACRES AND OVER
NUMBER JAN. 1, 1920
FARMS OF 260 ACRES AND OVER
FARMS OF UNDER 50 ACRES
NUMBER JAN. 1, 1920
FARMS OF UNDER 50 ACRES

FIGURES 25 to 28.—The typical negro tenant farms in the Cotton Belt are from 30 to 50 acres in size, of which about half is in cotton (see Fig. 33). Many white farmers also have small farms, both in the Cotton Belt and in the Corn and Winter Wheat Region (see Figs. 30 and 31). Farms of 50 to 100 acres are characteristic of the white cotton farmers in the upper Piedmont of the Carolinas and Georgia and the Black Prairie of Texas; also of the fair to good soils in the Corn and Winter Wheat Belt and in the Hay and Dairying Region. On the richer lands of the Corn Belt farms of 100 to 260 acres prevail. Large farms—over 260 acres—also are found in the western Corn Belt and Cotton Belt, but especially in the Hard Winter Wheat, Spring Wheat, and Columbia Plateau Wheat regions. Canada statistics are for June 1, 1921. (Adapted from maps in 1921 Yearbook, U. S. Department of Agriculture.)

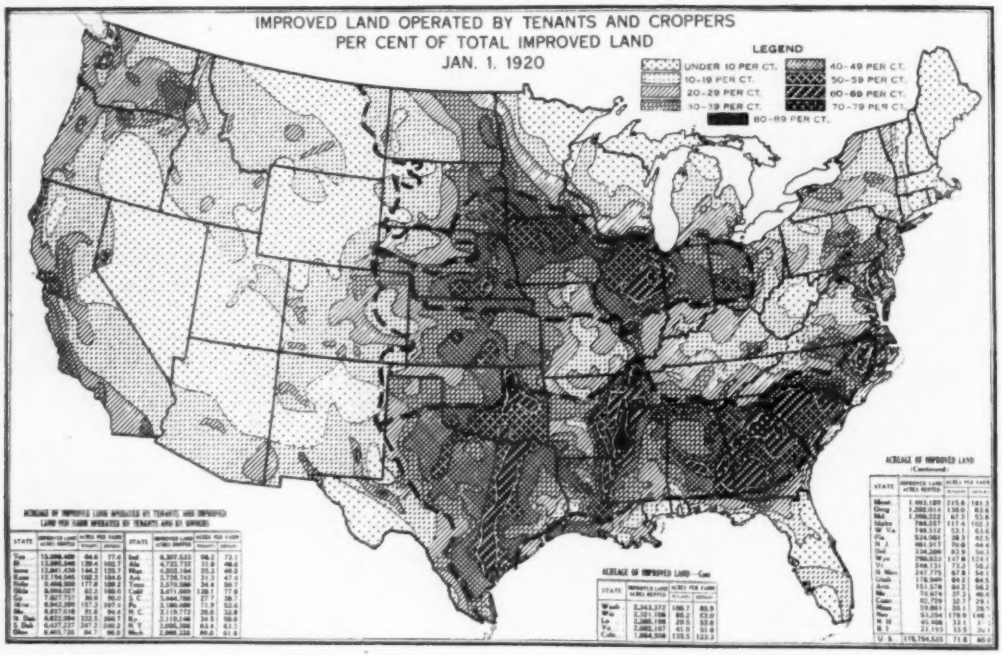
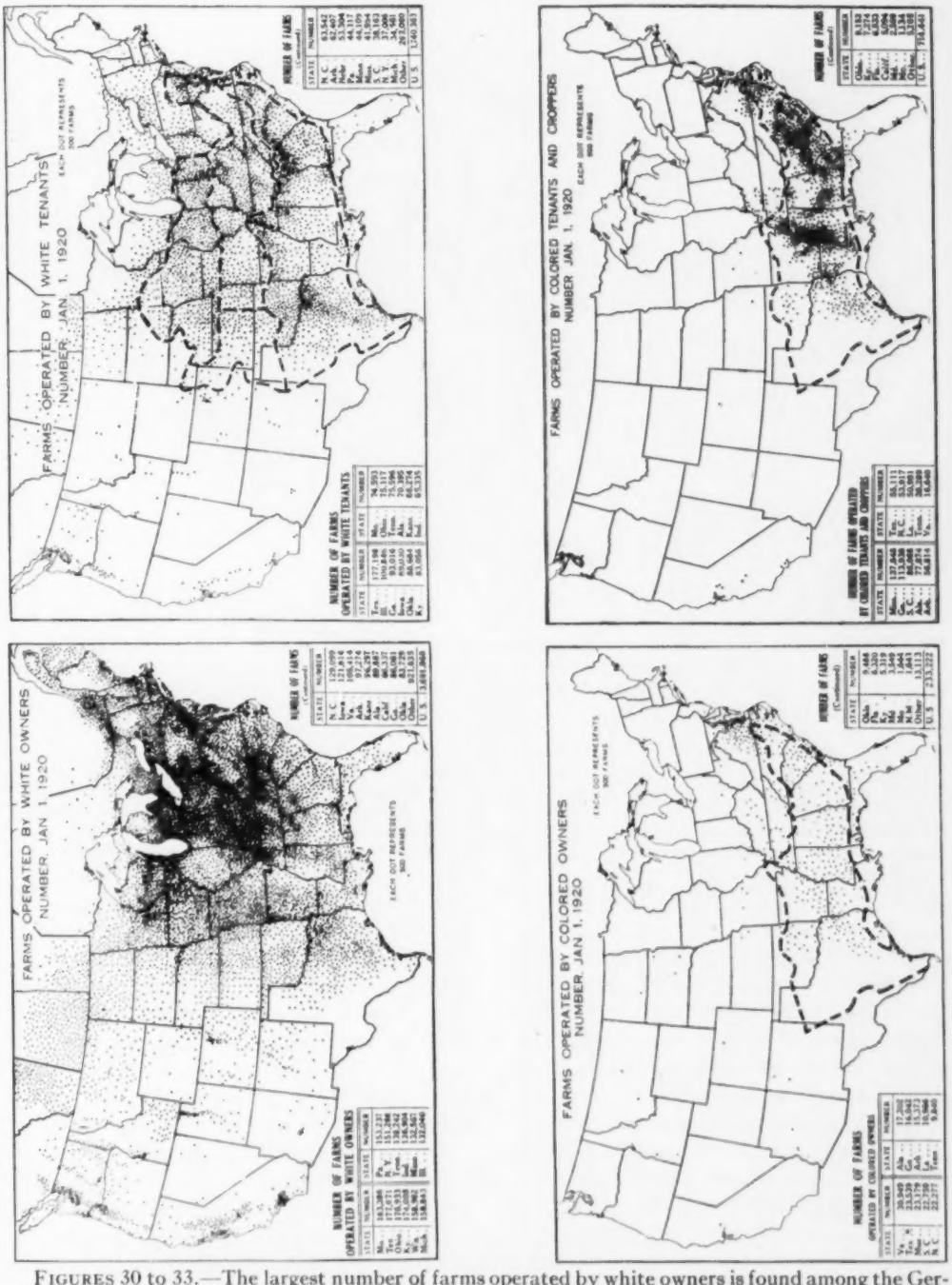


FIGURE 29.—This map shows the relative extent of tenancy from the standpoint of improved land. The principal areas having over 60 per cent of the improved land operated by tenants are the ri hest portions of the Corn Belt and of the Cotton Belt, which regions have been enclosed by broken lines on the map. These are our most productive areas in which many of the farmers or planters can afford to retire to town and be supported by the rent of their farms. The small proportion of improved land operated by tenants in the hills of New England, in the southern Appalachian Mountains, on the sandy lower coastal plain of the South, and in the arid areas of the West is noteworthy. The dashed north-south line is the eastern boundary of the arid Grazing and Irrigated Crops Region. (Map from 1921 Yearbook, U. S. Dept. of Agriculture.)

begins, or like oats in the northern Corn. Belt, which can be seeded in the spring before corn planting time, he will do so, even though he may not receive from the small-grain crop as good pay for his labor and for the use of land and equipment as from the corn crop.

5. Not only is it desirable to grow such a combination of crops as equalizes the seasonal requirements of labor, but also it is important to grow such a combination of crops as will maintain soil fertility and promote freedom from insects and disease. In the United States and Canada this purpose is achieved, at least partially, by planting (1) an intertilled crop, commonly corn, sugar beets, or potatoes, the cultivation of which destroys weeds and prepares the land for seeding that fall or the next spring, (2) a small grain crop (wheat, oats, barley, or rye), with which (3) grass or leguminous seeds (timothy, clover, etc.) are usually sown. The grass seeds produce a hay meadow the following year, which may be left down for pasture a fourth or fifth year. The grass roots add humus to the soil, and the leguminous plants also add nitrogen, while the cover afforded by the grass greatly lessens erosion. Wheat, oats or other small grain is an essential part in such a rotation, and, consequently, is grown in some regions where it would not otherwise be produced.

6. Lastly, but not least important, is the character of the farm population and the accumulated community skill and experience. Some people, such as the Indian tribes of Mexico, have become accustomed for many generations to growing corn, do not know how to grow other crops, and are slow in responding to the economic advantage of doing so.


FARMS OPERATED BY WHITE TENANTS
NUMBER, JAN. 1, 1920
EACH DOT REPRESENTS 500 FARMS
NUMBER OF FARMS OPERATED BY WHITE TENANTS
FARMS OPERATED BY COLORED TENANTS AND CROPPERS
NUMBER JAN. 1, 1920
EACH DOT REPRESENTS 500 FARMS
NUMBER OF FARMS OPERATED BY COLORED TENANTS AND CROPPERS
FARMS OPERATED BY WHITE OWNERS
NUMBER, JAN. 1, 1920
EACH DOT REPRESENTS 500 FARMS
NUMBER OF FARMS OPERATED BY WHITE OWNERS
FARMS OPERATED BY COLORED OWNERS
NUMBER, JAN. 1, 1920
EACH DOT REPRESENTS 500 FARMS
NUMBER OF FARMS OPERATED BY COLORED OWNERS

FIGURES 30 to 33.—The largest number of farms operated by white owners is found among the Germans of southeastern Pennsylvania and eastern Wisconsin, the mountaineers of western Pennsylvania and the southern Appalachians, the Canadians, and the pioneers of the West. The largest number of white tenants is along the northern margin of the Cotton Belt and in the Black Prairie of Texas, where negroes are less numerous, and in the Corn Belt. The largest number of negro owners is on the poor and cheap lands of the Cotton Belt or its margins, and the largest number of negro tenants is on the richest lands of the Cotton Belt. Canada statistics are for June 1, 1921. (Adapted from maps in 1921 Yearbook, U. S. Dept. of Agriculture.)

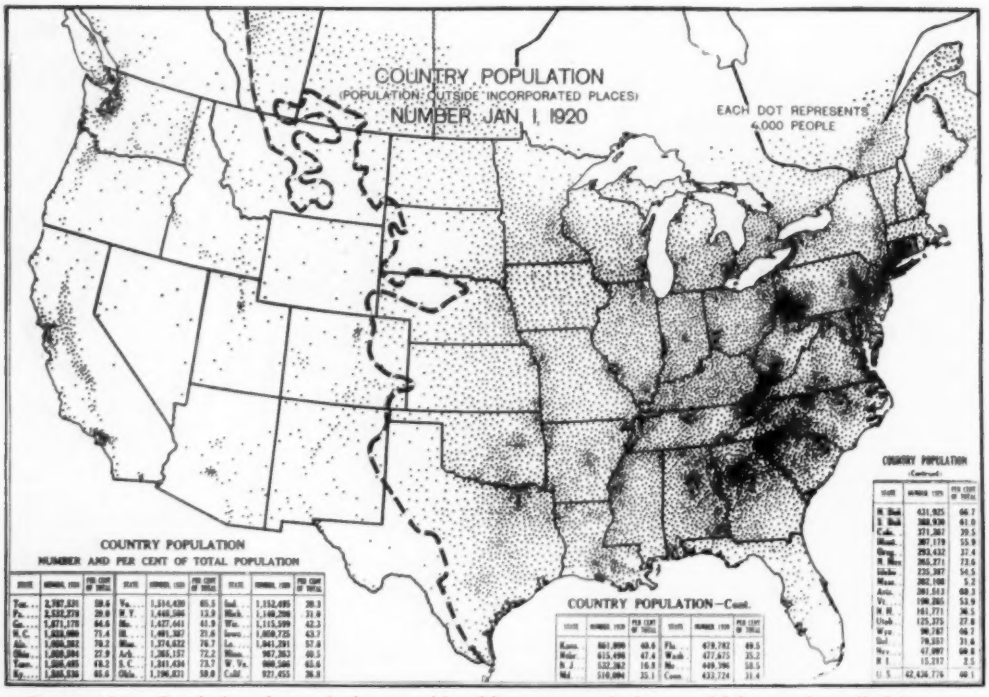


FIGURE 34.—Statistics of population outside of incorporated places, which may be called "country population", although including many suburbanites, mill workers, and miners, especially in Pennsylvania, afford the closest approximation to farm population in the United States at present available by counties. In the 1920 census the enumerators indicated for the first time persons living on farms. The resulting tabulation, made only by States, shows 31,614,000 people, or about three-fourths the "country population." This "country population" is densest in the Cotton Belt and the Winter Wheat Belt, is much thinner in the Corn Belt, especially the western portion, and is thinnest of all in the Grazing and Irrigated Crops Region, which is largely desert. Little difference in density is discernible between the United States and Canadian sides of the international boundary. The Canadian data are for "rural" population June 1, 1921, but include, apparently, only unincorporated population, and are, therefore, comparable with the data shown for the United States. Canada statistics are for June 1, 1921. (Map copyrighted by O. E. Baker, 1926.)

As education becomes more widespread and farmers more responsive to economic stimulus, this factor tends to diminish in importance, while the previously mentioned economic factors tend to increase in influence.

On the other hand, it is to the economic advantage of the best farmers to cultivate the best land and there is undoubtedly a strong tendency for them to do so. This trend neutralizes somewhat the leveling influence of widespread educational efforts and tends toward the increasing geographical segregation of the more successful from the less successful farmers.

THE TREND IN LAND UTILIZATION

These six economic principles are also helpful in understanding the utilization of the land for crops in competition with pasture and forest. The crops, having a narrower climatic range than pasture grasses, and also yielding normally a greater gross product per acre, whether measured by quantity or value, have first choice of the land, that is, crops tend to displace pasture on the more productive soils. As population increases, crops likewise tend to press the forests off the good soils, and onto the cold, the very humid, the hilly, sandy or stony lands of the continent.

But some land in most systems of farming is kept in pasture in order to lessen the amount of labor required by livestock during the summer season when the crops need attention, and also

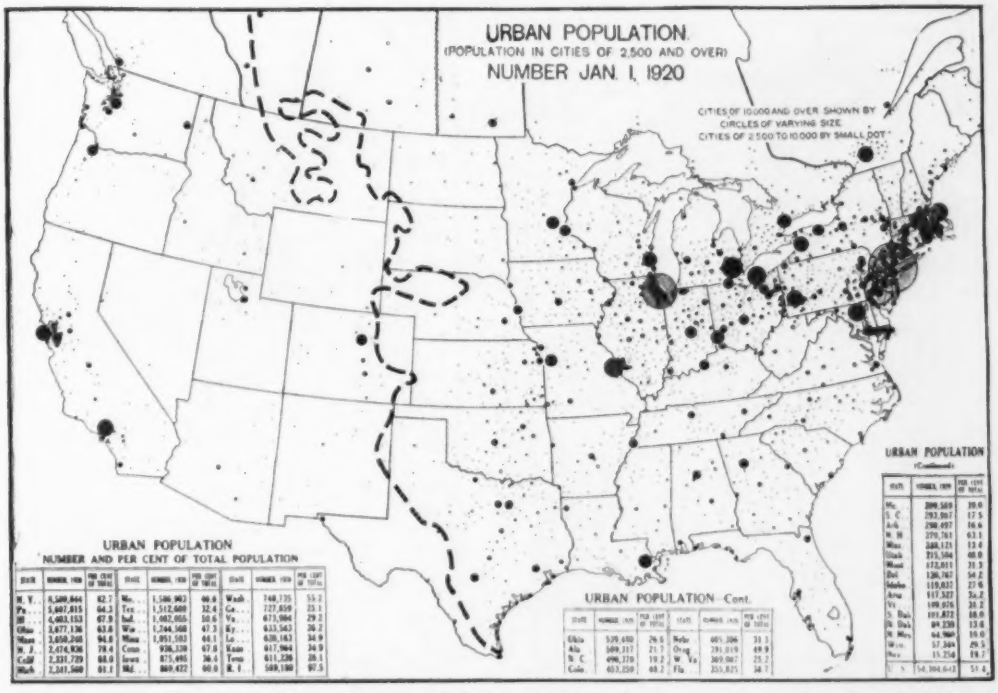
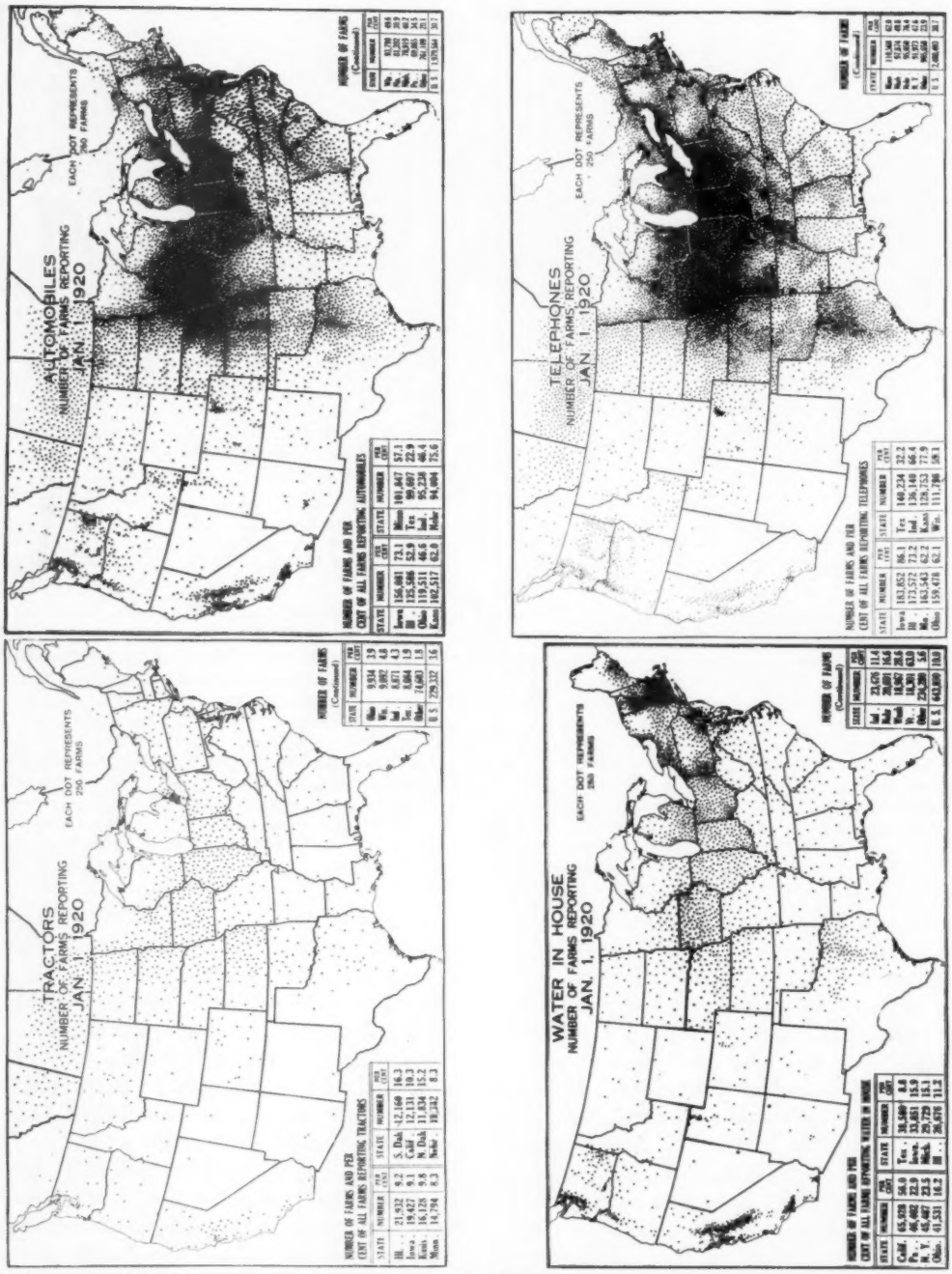

URBAN POPULATION
(POPULATION IN CITIES OF 2,500 AND OVER)
NUMBER JAN. 1, 1920
CITIES OF 10,000 AND OVER SHOWN BY CIRCLES OF VARYING SIZE
CITIES OF 2,500 TO 10,000 BY SMALL DOT
URBAN POPULATION
NUMBER AND PER CENT OF TOTAL POPULATION
URBAN POPULATION—Cont.
URBAN POPULATION
(Continued)

FIGURE 35.—Over half of the urban population in the United States and over three-fourths that of Canada reside within the Hay and Dairying Region. The urban population in this region constitutes nearly three-fourths of its total population, and over one-fourth of the total population of the United States and Canada. Into this region the food and fibers of the West and South constantly move. The center of urban population of the United States, however, is located in the eastern portion of the Corn Belt, near Piqua, Ohio; while the center of agricultural production is over 400 miles to the west, near Jefferson City, Mo. Outside this Hay and Dairying Region, the principal centers of urban population are found along the northern margin of the Corn and Winter Wheat Region, and on or near the Pacific Coast. Towns of 2,500 to 10,000 population are shown by the smaller size dot; larger cities by circles of varying size. Canada statistics are for June 1, 1921.

because pasture promotes the maintenance of soil fertility. It is also profitable on many farms, provided the land is not too high priced, to retain a small woodlot to supply fence posts and fire wood, even on land that might be cleared for crops. Such forest products are bulky relative to value, and their cost is increased many fold by transportation over long distances, consequently the farmer often can sell to himself at retail, so to speak, at a profit.

The utilization of the land in the agricultural regions depends upon these two groups of factors, physical and economic, and there results a constant flux and readjustment in accordance with the trend of population and consumption tastes, with decisions as to public policy (tariffs, etc.), in brief, according as the varying demands for and fluctuating prices of crop, pasture and forest products press with unequal weight against the more or less elastic physical conditions of climate, topography and soil. Consequently, the boundaries of the agricultural regions more particularly where determined primarily by climatic conditions, may not remain at precisely the line shown on the map, but will move back and forth, normally within narrow limits, as economic conditions change. The margin of the Cotton Belt, for instance, has moved northward during the past decade, from 20 to 30 miles in North Carolina, fully 50 miles in the upper Mississippi delta near Cairo, Illinois, and as much as 100 miles in western Texas, owing to the higher price of cotton and the greater freedom of this



FIGURES 36 to 39.—Tractors are most numerous in the wheat and corn growing regions and least numerous in the Cotton Belt and trucking regions. The acreage of cotton a farmer can handle is not limited by the acreage he can plow and plant, as with wheat, or can cultivate, as with corn, but by the amount he can pick, and a tractor cannot help in picking cotton. But an automobile can be used by everyone on the farm, and so everybody, apparently, who can afford an "auto" has one. In the Corn Belt nearly every family has an auto, in the Hay and Dairying Region about half the families, in the Cotton Belt about one in seven. Water piped into the house is very helpful for the farmer's wife, but only in New England and California do more than half the farmers, apparently, esteem it essential. Telephones are densest in the Corn Belt and Hay and Dairying Region. Canada statistics are for June 1, 1921.

northern margin from attacks of the boll weevil.[3]

THE UNIQUE OPPORTUNITY FOR THE STUDY OF AGRICULTURAL GEOGRAPHY AFFORDED BY THE UNITED STATES AND CANADA

In this connection it seems deserving of mention that the United States and Canada afford a better opportunity for the study of the inter-relationships of physical conditions and economic forces upon agricultural development and the geographic distribution of the crops, livestock and systems of farming, than any other portion of the world. This unparalleled opportunity which these countries afford is due principally to two reasons:

(1) The extraordinary diversity of physical conditions.

(2) The extraordinary uniformity of economic opportunity and of social conditions.

First, as to temperature conditions: the entire range of temperatures, from tropical to frigid, occurs in the United States and Canada, represented on the one hand by sugar-cane, pineapples and coconuts produced in southern Florida, and on the other by tundra grazing grounds, reindeer and fur bearing animals found in the barren lands of northern Canada.

Second, as to moisture conditions: portions of the west coast of Washington and British Columbia receive an annual average precipitation, mostly rain, of over 100 inches a year. This region, one of the wettest in the world, almost excludes crops, but produces good pasture and magnificent forests. About 200 miles east, in the Columbia River Basin, the average rainfall at several places is only seven inches a year. The Mohave-Gila Desert region of southeastern California and southwestern Arizona is one of the driest regions in the world. Here an annual rainfall under five inches is insufficient even for grazing, owing to lack of pasturage, or to absence of wells and water holes.

Third, as to topographic conditions: the lowest point in Death Valley, California, is 275 feet below sea level, and about seventy-five miles west rises Mt. Whitney, whose summit, the highest point in the continental United States, is 14,500 feet above sea level. Mt. McKinley in Alaska attains an elevation 20,000 feet above sea level. Over one-eighth of the land area of continental United States, or about 250,000,000 acres, is too rough or mountainous for the production of crops. On the other hand, the United States possesses several of the largest areas of nearly level land in the world, notably the Red River Valley of North Dakota, the Staked Plains of Texas, and the Sacramento-San Joaquin Valley of California.

Fourth, as to soils: the United States and Canada possess nearly all varieties of soils that are to be found in subtropical, temperate and frigid climates. The United States also has vast areas of arid and semi-arid, as well as humid, soils; and as the moisture belts cross the temperature belts at right angles in the central portion of the continent, instead of paralleling them as in Europe, a checkerboard of soil types with reference to climatic conditions is afforded the student. Moreover, both countries contain soils derived from granite, from limestone, from sandstone, from shale, and a great variety of other rocks. There are water-laid soils, wind-blown soils, glacial soils and residual soils. With about one-third of the United States covered by detailed or reconnaissance soil survey

[3] In drawing the boundaries of the agricultural regions and sub-regions, therefore, although the present situation, as shown by the statistics, was given primary attention, the probable trend of development as the population of the continent increases was also taken into consideration, notably in extending the Cotton Belt and the Hard Winter Wheat Belt across the Great Plains to the margin of the desert, that is, to the line where the physical conditions are so adverse that it seems unlikely that crop production will become generally profitable, even were prices twice as high as at present. However, at present approximately 10 per cent of the land area along this line is in crops, and as an acre of crops along this arid boundary normally has a value ten to twenty times that of the products of the pasture, it is evident that even at present the value of the crops along this margin is as great as the value of the pasture.

maps, also several districts in Canada and Central America, as well as much of Cuba and Porto Rico, North America offers unparalleled opportunity for the study of soils.

Now, we come to the strange fact that over this land of infinite variety in temperature and moisture conditions, topography and soils, there has been spread the most uniform civilization and culture that the world has ever known. From Nova Scotia and New England to California and British Columbia, from Alabama to Alberta and Alaska, the people speak the same language, read the same magazines, travel in the same Pullman cars or steamships, put up at the same kinds of hotels, sleep in the same kinds of beds, eat the same kinds of food, possess much the same average wealth, think the same thoughts, worship practically the same God. This unparalleled uniformity is the more remarkable when we recall the diversity of race, religion and social status from which these people have sprung—English, German, Scandinavian, French, Spanish, Italian, Greek, Russian, Jewish, native Indian, and negro; Protestant, Catholic and many minor sects; former slaves and freemen; illiterate and educated; poor and rich. The political and social institutions which the English-speaking world created have here shown a mighty efficacy in welding these people of diverse races and religions, who are living under such varied environments, into the two most homogeneous and similar nations the world has ever known. Moreover, this uniformity has been accomplished within a century, whereas Europe, after a thousand years of opportunity for amalgamation, has failed utterly to achieve it.

Owing to this uniformity of social conditions in the United States and Canada and the strong pressure of economic competition, to the extraordinary facilities for rapid dissemination of new ideas (agricultural colleges, county agricultural agents, agricultural papers and magazines, radio, etc.), and to the almost perfect mobility of capital and labor, it is possible to measure the influence of the physical factors upon agriculture with an accuracy almost comparable with that obtainable in laboratory experiments, for, as in the laboratory, other factors than those it is desired to measure have been largely eliminated.

The one serious obstacle to an increasingly accurate adjustment of the use of the land and systems of farming to the physical conditions is the tariff barrier between the United States and Canada; but this impediment is rendered less significant by the fact that both countries at present are exporters of wheat, beef, and pork and, therefore, the prices of these important commodities in one country tend to approximate those in the other, because both are determined largely by the world market.

In Europe, on the other hand, there is a multiplicity of tariff barriers which prevent the free movement of farm products and the most economic adjustment of agricultural production to the physical conditions. The agriculture of Europe is more localized than that of North America,—a large and nearly uniform Corn Belt is absent, though this is owing more, perhaps, to the interruptions of mountain ranges than to tariff walls; no Corn and Winter Wheat Belt, no Hay and Dairying Region stretch half way across the continent as in the United States. Each European nation aspires to be sufficient unto itself and consequently it is much more difficult to recognize agricultural regions and trace the trend of their development. (*See "Agricultural Regions of Europe," by Olof Jonasson, Economic Geography, October 1925 and January 1926.*)

In China the tariff barriers are even more abundant than in Europe, the "liken" tax on commodities being collected at each province boundary and often at the gateway to a city. Moreover, transportation facilities are primitive, and each province, often each city, becomes more dependent upon its surrounding area than a European nation is upon the land within its territories.

Only Russia (U. S. S. R.), of all the agricultural countries of the world, is of sufficient size and economic homogeneity to develop agricultural regions comparable in close adjustment to the physical conditions with those of the United States and Canada; and in Russia as yet both transportation facilities and farm capital are so limited that the response of agricultural development to the physical conditions is much less precise than in the United States. However, the agricultural situation is changing rapidly in Russia. The government is making a vigorous effort not only to educate the farmer, but also to supply him with the machinery and other forms of capital that he needs so badly, consequently it seems not unlikely, if the increase of population can be controlled, that Russia will follow rapidly in the footsteps of the United States and Canada in its agricultural development. It behooves the agronomists and agricultural economists of the United States and Canada to watch the evolution of agriculture in Russia with the same care that the Russians are studying the agricultural development of North America. Geographic conditions are similar, economic differences are diminishing, the peoples are much alike, and each has learned and still has much to learn from the other. (In the next issue the agricultural regions of the Southern States will be described by Dr. Baker).

CARIBBEAN TROPICS IN COMMERCIAL TRANSITION

Victor M. Cutter

President, United Fruit Company

THE influence of geographic factors upon economic development is nowhere better illustrated than in the banana industry, which begins with the cultivation of the fruit in the tropics and ends with its consumption, mainly in the temperate zone, and even as far north as the sub-Arctic regions. Geographic factors have also made essential the many other activities in which all banana companies are today engaged. The development of the industry would have been impossible without the aid of radio, the maintenance of hotels, and improvements in transportation, refrigeration, and sanitation. The United Fruit Company controls about 50 per cent of the banana industry and the other half dozen companies are operated along the same lines. Therefore, a detailed account of the growth of this company, with an analysis of its many activities, will give the clearest obtainable picture of the effect geographic conditions have exercised upon the development of a world industry.

Reclaiming the Jungle

In twenty-six years the United Fruit Company has earned the title "the greatest farmer in the world." From an acreage greater than ever was tilled by any farmer, or group of farmers, known to ancient or modern history, it produces bananas, sugar, coconuts, and cacao. Each of its farms has been reclaimed from tropic or semi-tropic jungles—land unavailable for the growth of wheat, corn, barley, or, in fact, any cereal, vegetable, or fruit grown in temperate regions.

The company's activities cover almost every phase of human endeavor. In its effort to keep pace with the world's ever-growing demand for food, the company employs approximately 70,000 workers. It maintains a fleet of ninety-three seagoing vessels; has installed and operates an elaborate system of radio telegraphy, telegraph, and telephone lines, sugar mills, a model sugar refinery, ice plants, electric light plants, laundries, hospitals, water works, and sewerage systems. There are 31,000 head of cattle on its tropical "farms" and 11,000 head of draught animals.

Acreage of Plantations

The plantations operated by the United Fruit Company comprise approximately 1,615,000 acres of land owned by the company and 219,000 acres of leased land. This total acreage of 1,834,000 acres, representing a land investment of $15,730,840, is located in nine tropical and semi-tropical countries—Colombia, Costa Rica, Cuba, Guatemala, Honduras, Jamaica, Nicaragua, Panama, and the Canary Islands.

Of this tremendous acreage, 325,000 acres are now under intensive cultivation, while 1,201,625 acres await development in the property actually owned by the United Fruit Company. Bananas are cultivated on 172,000 acres; approximately 90,000 acres are devoted to sugar cane; 9,000 acres grow coconuts; 50,000 acres produce cacao, and approximately 4,000 acres are given over to the raising of other tropical products.

Transportation Facilities

The transportation system required to serve this vast enterprise includes ninety-three ships which, as the Great White Fleet, sail under orders from the United Fruit Company.

There are also 1,541 miles of railway and 722 miles of tramways, on which 187 locomotives and 22 tram engines are

FIGURE 1.—The farms of the United Fruit Company, totaling almost two million acres of land, are located in eight countries of the Caribbean tropics. In addition, a minor acreage is operated in the Canary Islands. Bananas occupy about one-half the cultivated acreage at present. Sugar cane, coconuts, and cacao are also produced for export. The variety of tropical products grown on the Company's plantations is increasing yearly.

used, together with 5,320 railway cars and 1,859 tram cars.

LOCATION OF PLANTATIONS

Farming in the tropics is a vastly different undertaking from farming in temperate latitudes. It is axiomatic in the North that overhead can be kept down, and profits thereby increased, by the consolidation of acreage. In the tropics, however, it is necessary to separate plantations by wide intervals in order that a sufficient supply of fruit may always be available and that production costs may be kept at the minimum despite torrential tropic rains, wind-storms, and other eventualities peculiar to this part of the world. The fruit on one plantation may be ready to cut when, overnight, a tropic storm may arise which will level the plants on hundreds of acres. The fruit is ruined; a year's work goes for naught.

The wide spacing of plantations, therefore, not only minimizes the dollars-and-cents loss from each such disaster, but makes it possible to draw upon plantations which lie outside the path of the storm so that supplies of fruit for shipment to the North may not be too greatly interfered with. Again, when one plantation has been laid waste, it can be rehabilitated while others are still producing, whereas consolidation of acreage would mean the practical cessation of production for a long period of time.

It must be remembered that bananas are what is known as a "soil-killing" crop. Soil-starvation manifests itself in smaller stems of bananas and fruit irregularly disposed on the stem. Land planted to bananas is good for the production of first-class saleable fruit for a period of approximately ten years. It is then a question of abandonment or facing a steadily diminishing crop. If abandonment is decided upon the land is allowed to lie fallow for a period and then planted to some other crop.

As good banana land becomes increasingly difficult to obtain, the United Fruit Company must, in the years to

come, rely more and more upon the rotation of crops. One of the problems confronting the company is to find crops which will produce profitably on land unfit for banana culture, or on banana plantations which are for a time unsuitable for the growth of bananas. Coconuts, sugar, cacao, and pineapples are all grown by the United Fruit Company, and experimental work is constantly being carried on in order that the most efficient utilization may be made of plantations that are being rehabilitated and made ready for growing further crops of bananas.

PHYSICAL REQUIREMENTS OF BANANAS

Bananas grow best in a fine, sandy loam having good drainage. The Atlantic coast of Central America offers almost ideal conditions for banana culture, and it is in these low-lying alluvial plains where there are hot days and humid nights and an annual rainfall of from eighty to one hundred and fifteen inches that the tropic jungle has given way to the greatest fruit farms in the world. Today vast plantations with their correlated interests—railways, docks, stores, hospitals—dominate a landscape which forty years ago was an uninhabited primeval jungle.

CREATING A BANANA PLANTATION

The establishment of a new banana plantation requires herculean labor. An untamed wilderness of trees, palms, vines, and ferns confronts the planter. Once the land is selected and surveyed, drainage ditches are cut and the underbrush is cleared out. Workers equipped with machetes hack out the undergrowth so that they may move about freely among the trees. Stakes are set at the intervals at which it is intended to plant in order that the plantation may have regularity and orderliness. The distance between these stakes varies according to the soil and climatic conditions. In Cuba and Jamaica, owing to the small growth of the banana plants, stakes are set about fifteen feet apart; in Central America the distance is usually from eighteen to twenty-four feet each way.

The seed in the commercial banana is atrophied, consequently the plant is propagated from suckers or "rhizomes." Plantations are set with pieces of root stock selected from vigorous plants from adjoining plantations. The roots are cut into "bits" usually weighing from three to four pounds each, and great care is necessary to see that each "bit" has at least one probably fertile "eye." At each stake a hole about twelve inches deep is made and in this the "bit" is planted, the "eye" toward the bottom. As the plantation develops, each "rhizome" sends up new shoots on all sides of the original plant. These "suckers" go to make other plants after the main stem, which bears but one bunch of bananas, has been cut down. This method of growth makes it necessary to set a plantation but once, as the suckers furnish a steady supply of new plants.

It must here be noted that whereas the northern farmer clears his land before planting his crop, in the tropics the reverse is the rule. The bananas are planted and the laborious work of felling the trees is then begun. The felling must be accomplished before the "rhizomes" have begun to sprout, as falling timber would damage the young and tender plants, but even though a tree trunk may crash down upon a row of freshly planted "bits," little harm is done, for young plants will grow up around the log and adjust themselves to conditions. The timber is not dragged away, nor does it need attention. The heat, rainfall, and humidity, together with bacterial organisms and fungi, quickly transform this enormous tangle of logs, branches and top growth into a mulch favorable to the growth of the young banana plants. The smaller branches decay quickly while the larger branches and trunks are completely rotted away within two or three years. Occasionally, in the case of hard timber, burning is resorted to, but usually this is unnecessary.

Three months after planting, the banana farm is ready for its first cleaning. Weeds and tropical undergrowth are cut away with the ever-useful machete and this process is repeated at intervals of three or four months until such time as the fruit is ready to cut.

While this work is going on, a system of railways has to be established in order that supplies and materials may be brought forward for the laborers. Quarters for employees and plantation laborers have to be built, pastures for work animals laid out and fenced, and tram lines laid through the plantation as fast as rights of way can be cleared. The work of the plantation is a constant race with time. Rainfalls are heavy and irregular, sufficient at times to interrupt construction work for a considerable period, and at any time a virtual flood may descend, destroying the result of several months' labor.

The superintendent of a banana plantation must be ready to meet any emergency that arises. At times excessive rains cause the rivers to overflow their banks and bridges and culverts are swept away, necessitating prompt replacement. Hurricanes are another destructive force; even a wind-storm, not exceeding in velocity twenty miles an hour, may prove disastrous to a plantation when the fruit is ready for cutting, on account of the heavy weight of the bunches of bananas. Drought is an ever-present menace, so also are many forms of insect life found only in the tropics.

FIGURE 2.—A well-kept banana plantation in the American tropics. Virgin forest bordering the cultivated area and residual trees between the rows of bananas bear evidence of recent reclamation from the jungle. Tropical plantations, under one management, usually are spaced far apart to minimize the effects of climatic and other hazards which yearly take heavy toll of life, property, and growing crops. The modern home of the district superintendent embodies improvements aimed to ameliorate the effects of the tropical climate.

The soil of the banana plantations is so soft and porous that it is found more economical to install light tram lines to bring out the fruit than to build wagon or cart roads. These tram lines are sometimes only a few hundred yards apart. The cars are hauled by draught animals, and form a perfect net-work over the plantation.

APPEARANCE OF THE BANANA PLANT

The banana is the largest of all the succulent plants. It contains almost 85 per cent of water, and what seems to

be the "trunk" of the young plant is really only a compact mass of over-lapping leaf sheaths, while the upper ends of the leaves bend away from the main stem to form distinct leaf stems. These immense leaves spread out from the main stem, giving a graceful, palm-like effect to the plant. The banana leaves average eight feet in length and two or more feet in width, and the number of leaves on a plant varies from eight to twenty according to the condition of the soil.

FIGURE 3.—A perfect stem of bananas ready for the cutter. The long blossom end is severed when the bunch is harvested and the plant is then cut down, to allow another sprout to take its place. Bunches of bananas usually weigh from sixty to seventy pounds and contain several "hands," each hand averaging from fourteen to twenty individual bananas or "fingers."

Within twelve months after the "bit" has been planted the plant attains a height of twenty to thirty feet, depending upon the rainfall and other climatic conditions. Some three or four months are required to develop a bunch of bananas to the point where it is ready for cutting, after the blossom appears. Each plant bears but a single bunch of fruit, which weighs from sixty to seventy pounds and contains about 140 bananas, each hand containing from fourteen to twenty individual bananas or "fingers."

MARKET CLASSIFICATIONS

For cutting and marketing, bananas are divided into classes according to the number of hands to the bunch. Nines are bunches containing nine fully developed hands. Eights, sevens, and sixes contain the number of hands indicated.

PRUNING

The banana is exceedingly prolific, and it is usually necessary to cut many of the young plants away after the first crop is harvested. Generally from two to five of the most promising shoots are allowed to develop, as, up to a certain limit, the number of suckers allowed to grow from a single "bit" will determine the hands which will be produced by the remaining stalks originating from that root.

Pruning is a job that requires considerable skill and judgment, for, as the plantation comes into full bearing, it is these remaining shoots which will replace those which have borne their fruit and been cut down. If all goes well, production becomes continuous over a period of several years.

SHIPMENT OF BANANAS

Upon receipt of news relative to the arrival of steamers and the quantity of fruit required for their cargoes, the central office of the division telephones to district headquarters orders for the necessary number of stems of bananas. Each farm overseer in turn figures on an allotment from the individual sections of his plantation, the cutters are forewarned and everything arranged so that cutting may begin at daylight.

It takes a practiced eye to select bunches of fruit of the proper grade and condition for shipment. Each section of each plantation is usually gone over twice a week so that the overseer has a fairly accurate idea of the number of stems which can be cut on a given day in each section. The men who cut fruit

in the section work there, at other jobs, every day. They know every plant.

A cutting gang consists of three men: "the cutter," the "backer," and the "mule man." The cutter, using a long pole to which is attached a sharp knife, nicks the main stem of the plant a few feet below the bunch, causing it to bend. Then, with a pole, the upper portion of the plant is held steady and the bunch of fruit is eased down onto the shoulder of the man waiting to receive it. A machete blow severs the bunch from the plant and another lops off the long blossom end. The backer then carries the bunch to the nearest tram-line, and the plant itself is cut down to quickly rot and become humus. Tram cars transport the bananas to the main transportation lines, where trains pick up the fruit at assembly points and move it to the seaports.

Bananas are never "tree ripened." Even when the fruit is to be consumed locally, it is cut green and ripened slowly. If allowed to ripen on the plant, the banana entirely loses its delicious flavor and becomes insipid; also, the skin bursts and insects attack the ripening pulp. In its green state the banana has not yet begun to undergo that wonderful change from starch to fruit sugar which takes place during the ripening process, and which makes the banana such a delicious and satisfying fruit.

LOADING THE BANANA STEAMER

Aboard ship everything has been made ready. The capacious holds have been pre-cooled and loading goes on day and night without interruption. So well have the various divisions of this work been coördinated that a cargo of 75,000 bunches can be placed aboard ship in from twelve to fifteen hours after the first stem of bananas is cut from the plant.

The fruit goes from the banana cars into loading machines where it is inspected again and all damaged bunches, as well as those showing any trace of yellow color, are rejected. Those accepted for shipment are counted as they are placed one by one in the canvas pockets of the conveyor which takes them into the holds of the steamship where gangs of experienced laborers carefully store the bunches in the various compartments provided to receive them. The bunches are stored on end, resting on the butt of the stem in from one to four tiers, the interstices between the stems forming natural channels for the circulation of air.

Bananas actually breathe, and in the breathing process absorb oxygen from the air and throw off carbon dioxide in much the same manner as do human beings. This makes necessary a special type of ship, constructed so that the fruit may be carried in well-ventilated chambers within a low temperature range.

Banana-carrying steamships have several decks separated by vertical partitions into compartments and bins. All iron work is sheathed and rough surfaces and sharp corners are carefully eliminated in order that fruit may not be bruised. The bins are constructed of wooden bars called "shifting boards" which keep the fruit from being crushed by the rolling of the ship.

Stored bananas give off a great amount of heat, and the refrigerating apparatus must contend not only with the natural heat of the fruit as it is loaded, but also with that which is generated during the voyage. It is for this reason that the refrigerating machinery used on a banana ship is more powerful than that required for a steamship of the same capacity carrying frozen meat.

During the entire voyage the fruit is inspected at hourly intervals day and night and the temperatures closely surveyed and recorded. In the winter when steamships are approaching the north Atlantic ports, it is sometimes necessary to resort to artificial heating to maintain the desired temperature.

According to the route and the speed of the vessel, bananas from Central American ports and from Jamaica reach New Orleans, Mobile, or Galveston in

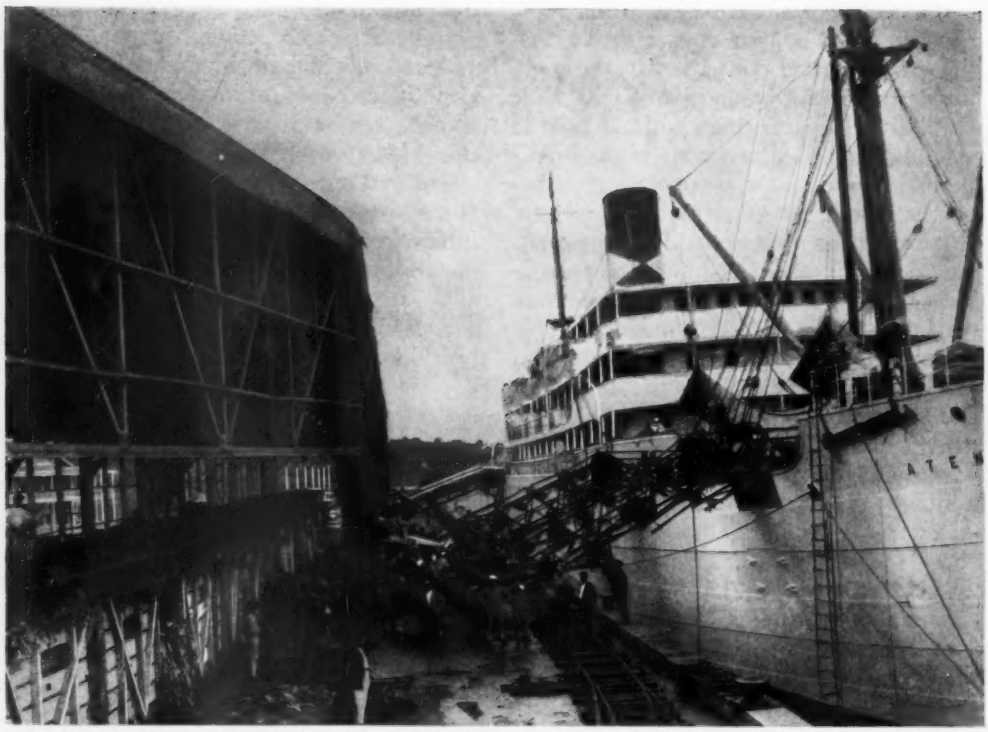


FIGURE 4.—Loading a banana steamer in a tropical port. Carloads of bananas are run out on the wharf alongside the steamer. Native laborers place the bunches on conveyors which automatically transfer the fruit to the hold of the vessel. Inspectors on the wharf reject all ripe and damaged bunches and count those accepted for shipment. Modern improvements to facilitate handling the fruit are constantly being adopted.

from three to five days. Boston, New York, Philadelphia, and Baltimore are reached in from seven to eight days, while fifteen or sixteen days are required to ship fruit to Great Britain and the Continent. On account of the longer ocean voyage, bananas shipped to Europe are less fully developed when cut than those destined for ports in the United States.

HANDLING AT RECEIVING PORT

The unloading of a banana steamship is a revelation to the man who likes to see work quickly and efficiently accomplished. At Mobile, New Orleans, and Galveston unloading machines handle the fruit at the rate of 5,000 bunches per hour. Great booms are lowered into the holds of the ship, a bunch is placed in each canvas pocket of the conveyor, carried across and down to the wharf where it is automatically turned out onto a horizontal belt which distributes the fruit to the doors of the cars making up the banana trains. All three decks of a banana steamship are unloaded at once. The longshoreman on the lower deck places a bunch of bananas in every third pocket of the conveyor, leaving two empty pockets which are filled from the middle and top decks, so that each pocket is filled when it reaches the dock. Inspectors stationed at each car door scrutinize every bunch of fruit, rejecting such as are scarred or not in good condition for shipment. All the bunches are carefully counted by checking machines.

At Boston, New York, Philadelphia, and Baltimore bananas are still unloaded by hand. The bunches are passed from one man to another and discharged either through the side ports or the deck hatches. In winter cold winds are kept

from the fruit by means of canvas curtains. Bananas are unloaded into railway cars on floats on the off-shore side of the steamer, and into cars or trucks on the wharf. The banana-unloading machinery, however, has proved so efficient that within a comparatively short time all ports at which bananas are received will be so equipped.

bananas, adjusting the ventilators, and taking temperatures. In other cases resident messengers stationed at divisional or junction points meet trains to inspect the fruit. Consignees are kept in close touch with their cars by telegraphic dispatches from these messengers.

Refrigerator cars are equipped with

FIGURE 5.—Refrigeration, ventilation, and protection against injury must be provided bananas in transit, both in the holds of steamers and in fruit cars.

After being inspected, the cars are weighed empty before being placed ready for loading, and are again weighed after loading to secure the accurate net weight of the bananas. The loaded cars are then made up into trains and dispatched over the various railroad lines on special fast schedules.

OVERLAND SHIPMENT

On long hauls "banana messengers" accompany the trains, inspecting the

slatted floor-racks providing an air space of from four to six inches under the load. By careful work these refrigerator cars are handled with a high degree of efficiency. It is a fact that bananas loaded into such cars at the port of New Orleans reach the Peace River District of Canada in prime condition.

During the summer season the cars are usually iced. Large cakes are used as they present less surface to the atmosphere in proportion to their weight and

therefore melt more slowly, providing a gentle cooling effect over a long period. The ventilators in the cars are carried partially open to provide the necessary circulation of fresh air and at the same time to prevent over-refrigeration.

In winter the cars are covered inside with heavy paper and sometimes with trusses of straw placed between the fruit and the sides of the car. In emergencies cars can be switched into large heating plants at various points en route where the fruit can be warmed to the required temperature. Fruit shipped to the northern parts of the United States and Canada is protected by car heater stoves provided by the railway companies.

DISTRIBUTION AND SALE

Bananas received through the Gulf ports are distributed all over the South and the Southwest, south of the Ohio and Potomac Rivers, through the Central West, through the territory lying west of the Mississippi, and into Western Canada. Fruit received at the Atlantic ports is shipped throughout the Northeastern States, north of the Ohio and Potomac Rivers, as far west as Cleveland and Detroit, and throughout Eastern Canada.

All this work is in charge of a subsidiary of the United Fruit Company—the Fruit Dispatch Company—which maintains forty-nine branches in the larger cities of the United States. These branches solicit and receive orders for fruit from the jobbers in their respective territories.

RIPENING THE FRUIT

An important link in the chain which extends from the plantation to the retail store is the ripening room of the jobber. The problem of properly ripening bananas so as to offer them to the consumer in the best condition and at the same time to preserve their maximum food value receives careful attention. Provision must be made for fresh air circulation and for the maintenance of the required temperature as well as for the proper percentage of humidity. A well-fitted banana-ripening room should have special heating and refrigerating apparatus. Fruit must be hung so that the bunches do not touch, and constant inspection is necessary in order to see that the ripening is neither unduly hastened nor retarded.

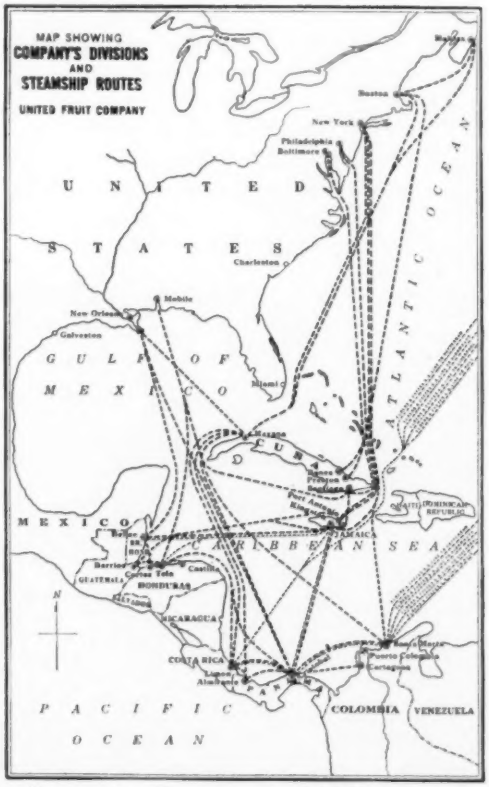


FIGURE 6.—The network of highways of the Caribbean Sea, Gulf of Mexico and the Atlantic Ocean traversed by the ships of the Great White Fleet. Bananas received through the Gulf ports are distributed throughout the southern and southwestern states; those which pass through the Atlantic ports find markets in the northern and northeastern United States.

HANDLING BANANAS IN EUROPE AND GREAT BRITAIN

The conditions governing the handling of bananas in Great Britain and on the Continent differ materially from those obtaining in the United States. In the United States a short sea voyage is followed by a long overland haul, whereas in England and Europe a long sea voyage is followed by a short rail journey.

Twenty-four hours after a cargo of bananas arrives in Great Britain or one of the European ports, it is safely housed in the jobbers' storerooms.

Throughout England bananas are properly ripened, cut up into hands, and packed into boxes which are transported by motor truck to the dealers in the small cities and towns. This method of handling bananas is known as the "flatting system," and is used, not only in Great Britain, but on the Continent with equal success.

Great White Fleet serves directly nine countries of the Western Hemisphere, and is a factor in the commerce of these countries. In the last ten years it has moved 14,000,000 tons of freight. All ships owned by the company are equipped with the most modern radio telegraph apparatus; these are in hourly communication with a chain of high-powered radio telegraph stations which rim the Caribbean and transmit their messages to the company's stations in the United States.

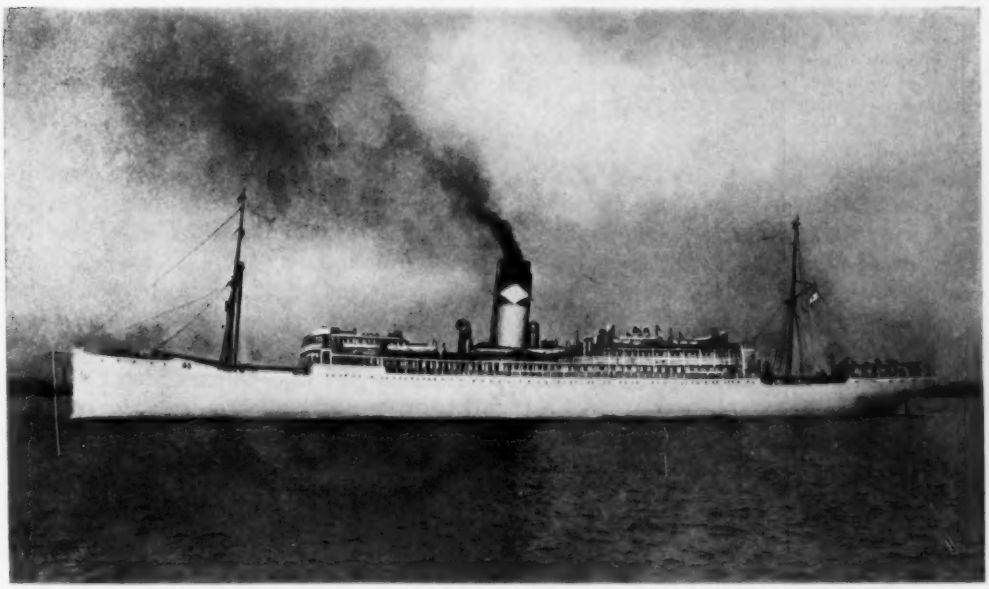


FIGURE 7.—A modern ship of the Great White Fleet, owned by the United Fruit Company,—an important link between producing tropics and consuming temperate areas.

MODERN EQUIPMENT

Of great significance has been the work of the United Fruit Company in the installation and extension of modern improvements which have contributed to the commercial advancement of the American Tropics.

THE GREAT WHITE FLEET

The American fleet comprises thirty-eight ships. There are twenty-eight vessels in the British fleet, including three under construction, and the chartered ships bring the total strength of the United Fruit Company Fleet to ninety-three vessels at the present time. The

MEDICAL SERVICE

Perhaps no greater work has been accomplished by the United Fruit Company than its achievement in fighting disease in the tropics. From the beginning the company realized that if it were to succeed, it must combat unsanitary conditions and protect the health of its employees. The best that modern science had to give, in men and equipment, was secured for the United Fruit Company Medical Department, and, in the districts where the company operates, the health records now compare favorably with those of communities of equal size in the temperate zone.

FIGURE 8.—One of the eight modern hospitals maintained by the United Fruit Company in the Caribbean tropics. Improvements in sanitation and housing, and provision for medical care of employees have contributed to a decrease in the death rate among the Company's employees. Hospital at Limon, Costa Rica.

In 1924 the company invited the Tropical Disease experts of the world to a conference held in Kingston, Jamaica. They came from England, France, Italy, and Germany. The South and Central American Republics gave their best; our own Army and Navy sent representatives. The proceedings of the convention were published by the United Fruit Company and distributed without cost to the hospitals and medical foundations of the world.

Today the United Fruit Company's Medical Department operates eight modern hospitals in the tropics. It spends every year $250,000 in excess of receipts and an additional $275,000 for sanitation. The Medical Department has broadened its work to include the inhabitants of communities adjacent to the various plantations, as well as to include supervision of all matters pertaining to sanitation.

In every tropical division except Jamaica (here the company maintains field and hospital dispensaries) the company has a base hospital capable of accommodating from 150 to 250 patients. These hospitals are as well equipped as any hospital in the United States and both medical and surgical personnel are maintained at a high plane. Every hospital has a modern laboratory where research work is carried on. The results of investigation and experimentation are tabulated and published every year by the company in an elaborate report, which is circulated, free, to hospitals and medical institutions. It has long been recognized by the medical world that the hospitals and laboratories of the United Fruit Company are outposts which guard the health—not only of the West Indies—but of our own ports as well.

MODERN HOTELS

Two modern hotels are owned and operated by the company on the island of Jamaica, one in the city of Kingston, the other in Port Antonio.

RADIO TELEGRAPHY

The United Fruit Company, without question, has been a most potent factor in the development and application of commercial radio telegraphy. The story of what it has accomplished in developing its radio system is the history of the development of this means of communication in the Americas.

In 1904 the sole means of direct telegraphic communication with the entire eastern coast of Central America, the northern coast of Colombia, South America, and the United States was a lone cable station at Colon, Panama.

Messages from the United States to tropical America went by cable from Galveston, Texas, to Mexico; thence across Mexico and down the west coast of Central America to San Juan del Sur, Nicaragua, where they were transferred to Government owned and operated land wires for delivery to destination. It was impossible to maintain adequate and reliable telegraphic service *via* a route such as this, and delays of hours or days were of frequent occurrence—and delays in handling a perishable product like bananas are disastrous.

Pioneer Work

The establishment of a quick and sure means of communication was, therefore, essential to the development, not only of the United Fruit Company's business, but to all business in tropical America. With the advent of radio telegraphy it seemed possible that this means of communication might be developed to serve this section of the world more adequately than could any other system. At any rate, the United Fruit Company decided to give radio telegraphy a fair trial, and so, in 1904, stations were built at the company's divisions at Port Limon, Costa Rica, and at Bocas del Toro, Panama, and thus came into being the first radio telegraphic service in Central America.

There being no other means of communication by telegraph with Bocas del Toro, Panama, the Fruit Company's station at that point handles messages of the general public as well as of the company. In 1921, the Bocas del Toro station was moved to Almirante, Panama, where the company had established its new divisional headquarters, but it still handles messages for Bocas del Toro, Panama, by telephone from the Almirante Radio Station.

In spite of what would be today characterized as crude radio equipment, but which at that time was the best obtainable, and notwithstanding static and other conditions which make the operation of radio telegraph stations in tropical latitudes extremely difficult, the company was convinced from its experience with the Port Limon and Bocas del Toro stations that radio telegraphy could be developed into a practical means of communication, and it accordingly decided to continue the experiment. In 1906 stations were erected at Bluefields and Rama, Nicaragua, and the following year saw the installation of radio equipment on all ships of the Great White Fleet.

A Period of Expansion

With the operation of these stations the United Fruit Company had demonstrated, to its own satisfaction at least, that radio telegraphy had great possibilities, and as telegraphic communication with the countries of Central America was so unsatisfactory, it became the ambition of the company to provide those countries and Colombia, in South America, with an hourly radio communication service, either direct or by relay, with the United States and with each other. To this end a terminal station was acquired at New Orleans, Louisiana, and for the purpose of ship communication a relay station was acquired at Burrwood, Louisiana. A relay station was also erected at Swan Island in the Caribbean Sea.

In 1909 another relaying station was erected at Cape San Antonio, Cuba. This station was continued in operation until its destruction by the great hurricane of 1915 and the company was forced to abandon Cape San Antonio as a possible site for a relay point. In 1911 a high powered station was erected at Santa Marta, Colombia, and all other stations of the company were completely modernized. High powered equipment was also installed at Swan Island and New Orleans. The Tropical Radio Telegraph Company was organized in 1913 as a subsidiary of the United Fruit Company to take over and handle the radio telegraphic business of the company.

During the next few years stations

were added at Tela, Puerto Castilla, and Tegucigalpa, Honduras; Managua and Cape Gracias, Nicaragua, and Puerto Barrios, Guatemala; but the crowning achievement was the building at Hialeah, Florida, a suburb of Miami, of a high powered station, one of the largest on this continent, which was formally opened to public service in the fall of 1925, with Central and South America and the West Indies, as well as with ships at sea.

A large percentage of the telegraphic business of Colombia, Costa Rica, Nicaragua, and Honduras is handled *via* this radio system. A continuous night and day service is maintained and now instead of requiring hours or days to communicate with these countries, it is a matter of only a few minutes. Messages to the above-mentioned countries and for ships in the Caribbean and South Atlantic can now be filed in any telegraph office in the United States, Canada, or Europe with the assurance that they will be delivered promptly if marked "*via* Tropical Radio."

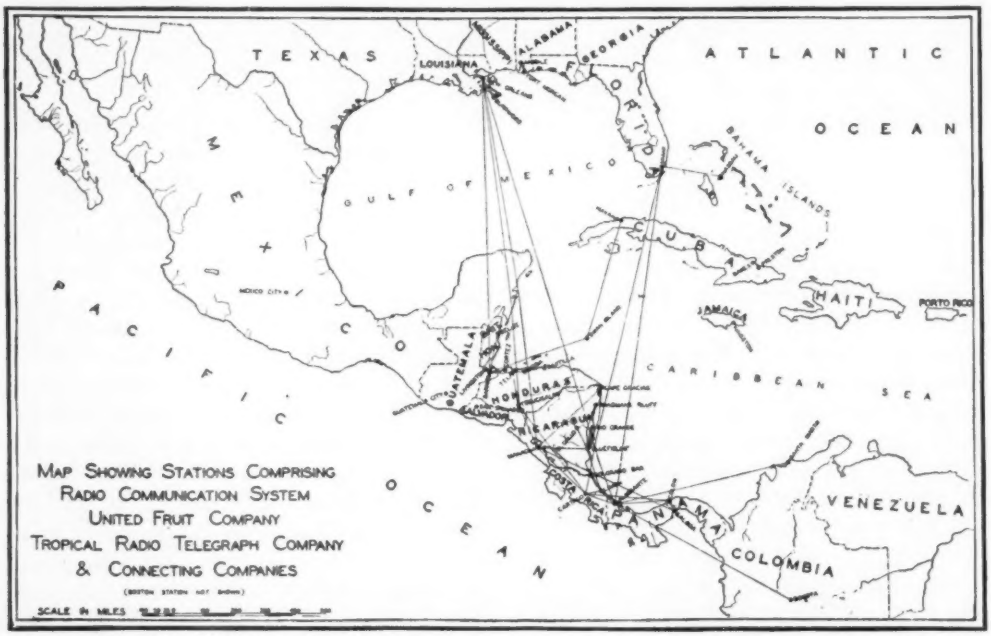


FIGURE 9.—The United Fruit Company was a pioneer in the development of commercial radio telegraphy in the Caribbean. This system today links by radio many ports of this region with the outside world.

Two High Powered Terminals

The Tropical Radio Company now has two high powered radio terminals in the United States for the sole purpose of furnishing radio telegraphic communication with the countries of Central America, Colombia in South America, and the West Indies. These terminals are also equipped to handle communications to and from all of the countries and islands of the Caribbean area and new circuits are being opened from time to time as facilities are made available at other places in this area.

The conception and carrying out of its radio policy has been an important work, not only for the United Fruit Company but for the commercial interests of Central America and the United States and for shipping in the Caribbean Sea and the South Atlantic Ocean. On not one but many occasions, the stations comprising the Fruit Company's radio system have afforded the only means of communication between Central America and the outside world.

The coöperation of the company's radio service has made it possible for the United States Government to issue reliable storm warnings to all shipping in tropical waters and on the Gulf Coast of the United States, with a resultant saving of millions of dollars and countless lives.

The company has also inaugurated a free medical radio service for mariners in conjunction with its many hospitals ashore *via* all the stations of its system. All of the ships of the Great White Fleet carry doctors and this free medical radio service is also available from the company's ships. This service is offered without charge to ships of all nationalities.

UNION WITH BRITISH INTERESTS

Twenty-five years ago, when the United Fruit Company was wrestling with the problem of insuring a supply of bananas for the United States and Canada sufficient to keep pace with the demand they foresaw would increase each year, the English company of Elders & Fyffes was making an effort to offer a similar banana supply service to Great Britain and a number of Continental European countries. At that time the English and European markets looked chiefly to Madeira and the Canary Islands for their bananas, and the Elders & Fyffes Company had plantations totalling 8,000 acres in the Canaries. Like the United Fruit Company, Elders & Fyffes had been obliged to develop a shipping service and a sales organization to handle the transportation and distribution of its banana crop.

In a very few years it became apparent that new sources of supply were imperative. The English and European demand for bananas was rapidly increasing to a point where the Canary Islands and Madeira could not begin to furnish sufficient fruit.

In 1903 Elders & Fyffes formed an association with the United Fruit Company, whereby part of the latter's banana production became available for shipment to European markets. This association was maintained until 1910, in which year Elders & Fyffes became a part of the United Fruit Company. This union brought into the Fruit Company the banana plantations in the Canary Islands, the well-developed European sales organization, and the Elders & Fyffes fleet. Today the Elders & Fyffes fleet numbers twenty-eight refrigerator fruit steamships—nine of which are equipped for carrying passengers—and three chartered ships. Nearly all of these ships are of very modern construction and all are radio equipped.

PRODUCTION OF SUGAR

Second in importance to the banana production of the United Fruit Company is the sugar production of its plantations in Oriente Province, Cuba. During the twenty-five years since the first experimental plantation of 8,000 acres was started near Banes, the output of raw sugar has grown to such an extent that a large subsidiary organization is required to handle the refining and distribution. The Revere Sugar Refinery in Boston carries on this important work, producing a high quality of refined sugar in all the usual commercial grades.

The cultivated lands of the company are yearly encroaching on the untamed jungle; the variety of products is ever increasing. A highly organized company, applying modern inventions, is today making tropic jungles contribute to the world's food supply.

ECONOMIC REGIONS OF ALASKA

Louis A. Wolfanger

Economic Geographer, Columbia University

ALASKA is the largest island possessed by the United States. Like all of our insular possessions, Alaska is physically detached by miles of distance from the mainland of the United States. The nearest corner, the southeastern, is separated by five hundred miles of land and water from the northwestern boundary of the United States. The only easy means of transportation thither is by steamer. Surrounded on three sides by water, the territory is connected peninsularly with Canada by a broad land base, and land routes are technically possible; but since Alaska is neither politically, economically nor industrially a part of Canada none are likely to be established. At present Alaska is more completely isolated with respect to routes of transport than the Hawaiian Islands.

Individuality of the territory is another insular quality. Islands in relation to mainlands commonly have distinctive peoples, peculiar cultures, characteristic industries, or other distinguishing traits which make them unlike their larger neighboring land masses. In this respect Alaska is also no exception, for it has peoples, industries and a culture exclusively its own.

EXTENT AND RELIEF

The most impressive physical feature of Alaska is its great size. Its peculiar configuration gives the territory unusual proportions in longitude and latitude. The spread in longitude is practically as great as that separating the states of Maine and Washington, about 2,500 miles. Its latitudinal expansion approximates that of the United States. The territory, however, is equal to only one-fifth of the area of the United States, but it is extensive enough to spread over as great distances as all of the states lying west of the Rocky Mountains.

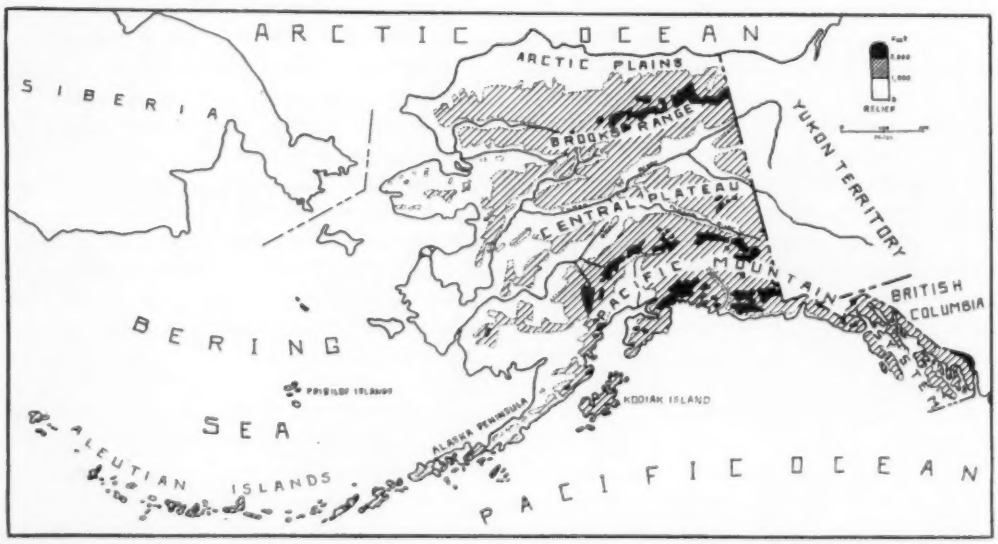


FIGURE 1.—Sketch map showing the major physical regions of Alaska. The landform outlines, and topography are generalized. The most notable details are the well-known Yukon "flats" in the Central Plateau. Data: U. S. Geological Survey maps and publications.

The Central Plateau

The midland of Alaska is a gentle rolling plateau of moderate relief, strikingly suggestive of the well known piedmont country of eastern United States. Near Tanana this land stretches more than one hundred miles to the north and south, and widens fan-fashion to the east and west. On the east it extends into the Yukon territory of Canada, but on the west, four hundred miles away, it dips into the cold Bering Sea. This interior region, Mississippi valley-like in its relation to Alaska, is formed by the broad basin of the Yukon and Tanana Rivers (Fig. 1).

The Pacific Mountains

The southern part of Alaska is a large, crescent-shaped area of mountains, rising boldly from the edge of the Central Plateau. The southeastern prong of the Pacific Mountains forms the northern part of the Coastal Ranges which, extending southward through British Columbia, become the Cascade Mountains of western Washington and Oregon. In general, this mountain mass rises little higher than the famous Blue Ridge of North Carolina, although local ranges in the north average higher and Mt. McKinley approximates twenty thousand feet. To the southwest, the mountain prong runs off the mainland, where it first caps a narrow peninsula and then forms a line of giant, fog-shrouded, volcanic stepping stones which extend westward toward the Kamchatka Peninsula of eastern Siberia.

The Arctic Regions

The north-central part of Alaska is crossed by an east-west range of slightly lower mountains. In contrast with the Pacific ranges, this clubshaped highland, the Brooks Range, rises gradually from the Central Plateau. Beyond it lie the great Arctic Plains which slope northward from the piedmont plateau at the base of Brooks Range to a low, flat coastal strip, fringed by the Arctic Ocean.

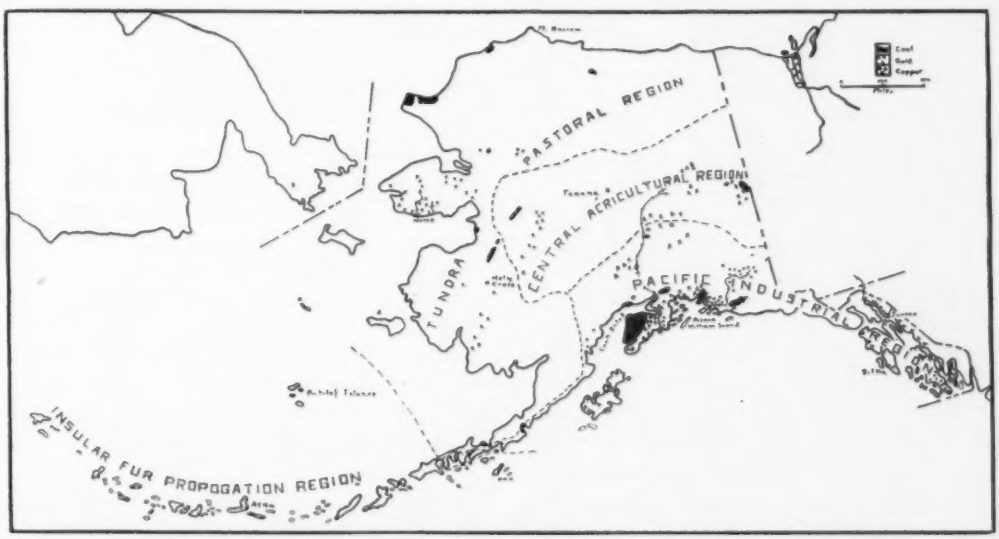


FIGURE 2.—The major economic regions of Alaska. There is a general but not close conformation to several of the physical regions. About one-third of the territory has been mapped by the Geological Survey. One half of the unsurveyed area is considered so inaccessible that its delineation may be deferred. The actual and potential economic development of Brooks Range and many other portions of Alaska are essentially unknown. The regional boundaries shown are therefore tentative but it is hoped that their indication will lead to a clearer understanding of the distribution and analysis of the principal economic activities and resources of the territory. Mineral data: U. S. Geological Survey.

ECONOMIC REGIONS

Four major economic regions may be distinguished in Alaska—(1) the Pacific

FIGURE 3.—Alaska Range, head of Rusty Creek, a tributary of Valdez Creek. Serrate peaks, bleak, uninhabitable mountain tops, ice and snow clad slopes make up a large part of the "upland barrens" of the Pacific Mountains. Grasslands extend far up the valleys of many streams heading in these snow-covered mountains, the U-shaped valley form being a conspicuous element of the landscape. In Bolivia these mountain valleys would be supporting nomadic bands of sheep and llamas herded by hardy Indian shepherds. The "water holding capacity" of the snow and ice cons itutes the most important asset to Alaska at the present time. (Courtesy of U. S. Dept. of Agriculture.)

Industrial Region, (2) the Insular Fur Propagation Region, (3) the Central Agricultural Region, and (4) the Tundra Pastoral Region.

THE PACIFIC INDUSTRIAL REGION

The Pulp Industry and the Salmon Industry constitute the chief economic activities of the Pacific Coast Region. The latter is threatened with decline, but the former is in its infancy, and with large resource of suitable pulp timber at hand promises to grow into a great business.

THE PULP INDUSTRY

The Pacific Industrial Region (Fig. 2) embraces the central and southeastern prong of the Pacific Mountain division. The resources of its coastal slopes and plains have yielded the greatest wealth of Alaska, but the crests of its mountain ranges are barren, bleak and snow-covered (Fig. 3). Most of the lower slopes, not occupied by glaciers, are heavily mantled with evergreen forests like the Coastal Ranges of British Columbia and the Cascades of Oregon and Washington.

The Evergreen Forests

A glance at the climatic chart of Sitka (Fig. 4) will reveal not only why the growth is so luxuriant but also why the trees are narrow-leaved evergreens. The length of the columns indicates an excellent rainfall distribution with each month sharing proportionately in the heavy precipitation. In some places the totals run well above one hundred inches annually, no part of continental United States receiving so much precipitation as the southeastern portion of Alaska.[1] Plentiful, well-apportioned rain results in copious forest growths. The temperature curve in relation to the freezing line explains why the trees are largely narrow-leaved evergreens. Warming winds blowing from the neighboring Pacific Ocean make the general form of the temperature curve flat, but it lies low near the critical freezing temperature. Broad leaved trees like the oak do not thrive under such cool, wet conditions, as do narrow-leaved evergreens, like the spruce and hemlock

[1] Summary of Climatological Data of Alaska, U. S. Weather Bureau, Sec. 1, p. 2.

(Fig. 5). The principal stand, consequently, is composed of these species with hemlock dominant.[2] (Fig. 6).

Utilization of the Forest

The forest resources of this region are among the most valuable that Alaska possesses. Norway, with a similar climate and an equally mountainous topography, has forest resources like Alaska. Three-fourths of Norway's lands

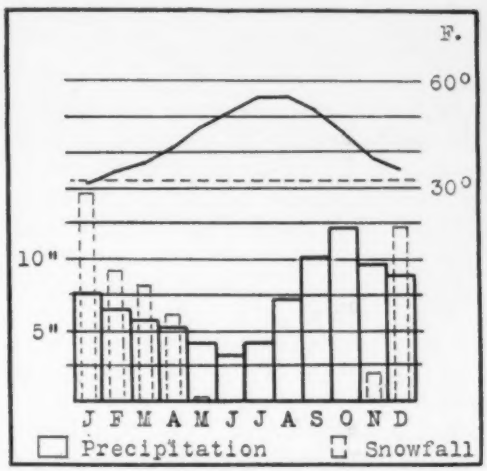


FIGURE 4.—Climate chart of Sitka, Alaska. Lat., 57° 3′; long., 135° 19′; elevation, 65 feet. This station is located near sea-level. Measurements taken at elevations of 1,400 and 1,500 feet in the Pacific Mountain Region appear to average 150 to 195 inches annually the usual increase of precipitation with elevation. The southern end of this region has the least sea-level snowfall. Data: U. S. Weather Bureau.

are unproductive agriculturally, but forest products make up one-fourth of her export to other countries.

What would the forests of Alaska mean to the United States? The stand is estimated at eighty billion feet, board measure.[2] The United States has a yearly appetite for fifty-one billions.[3] Eighteen months spent in feeding this prodigious mouth would completely wipe out Alaska's southeastern forests (Fig. 6). It is obvious, then, that Alaska's great resource must be put to some other

[2] Bulletin 1241, U. S. Dept. of Agriculture, pp. 53, 54.

[3] Report on Senate Resolution 311, U. S. Dept. of Agriculture, p. 38.

FIGURE 5.—Stand of hemlock and spruce on Revillagigedo Island, Tongass National Forest, Alaska. The limit of merchantable timber occurs about 2,500 feet above sea-level. While hemlock predominates, Sitka spruce is much more valuable but it has great difficulty in producing its seedlings under the dense shade of hemlock, with which it is closely associated. Hence it seems advisable to cut hemlock as rapidly as it can be utilized so that better conditions may obtain for spruce to multiply. (Courtesy of W. A. Langille and U. S. Forest Service.

use. That use is pulpwood. While many of the trees are of saw timber size and will increase enormously in value for lumber in the future, the real worth of the forest lies in pulp production.

Under careful management, the National Forests of Alaska can produce two million cords of pulpwood annually,[2] or enough to manufacture one-third of the pulp products now consumed in the United States, which, as recent as 1919, was importing almost two-thirds of its newspaper print from Canada[4] (Fig. 7). With the exception of developments in the forests under governmental supervision, however, crude or exploitive methods still characterize both milling and logging operations; a part of the best lumber, Sitka spruce, is used for making salmon cases.

[4] Bulletin 950, U. S. Dept. of Agriculture, p. 2.

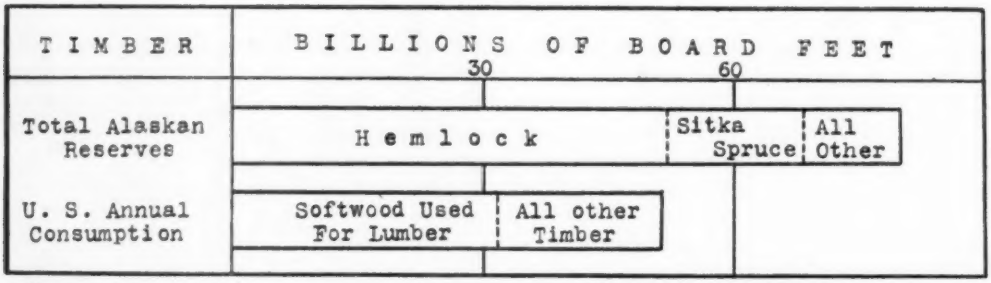


FIGURE 6.—Total timber reserves of Alaska compared with timber removed each year from the forests of the United States, exclusive of destruction by fire, insects, etc. About 80% is used directly for lumber. On this basis the Alaskan forests would "last" a little longer than two years since four-fifths of the lumber consumed is softwood, but such a utilization is properly called "mining timber." (Figures based on recent averages as given in "Report on Senate Resolution 311." Forest Service, page 38.)

Water Power

The abundant precipitation of this part of Alaska has given it not only a wealth of forests but also water power, the cheapest source of mechanical energy. The high Pacific Mountains catch the heavy rains. Their rugged elevations provide both the steep gradient necessary to secure the proper head, and the reservoir facilities for easy storage and ready release. The artificial construction of huge retaining dams is, in general, unnecessary. Since the maximum precipitation (Fig. 4) is in winter, and much of this falls in the form of heavy snow, snowfields and glaciers, for which this part of Alaska is so well known are common. Therefore, when the rainfall decreases during summer, these natural reservoirs, under the influence of the warming sun, release their waters in quantities inversely proportional to the decreasing rainfall. The streams, as a result, have their maximum flow at this season, and their power potentialities during this period are markedly superior to other regions not so favored.

The low flow during the winter months, however, is a serious defect in the water supply. Fortunately, many of the streams head in small lakes which occupy hanging valleys a short distance back from the shoreline and make their descent in a series of cataracts. These valleys are easily dammed and afford excellent storage facilities by means of which the low flow of streams in their natural state can be advantageously increased.

Waterpower is the second chief essential of a pulpwood industry. About 500,000 horsepower of continuous available power are annually required to convert the estimated yearly yield of two million cords of pulpwood. The known projects in Alaska have a possible development of over 465,000 average horsepower,[5] and the undetermined potentialities promise much more. The ascertained power is a sum approximately equal to four times the famous, but overestimated, Muscle Shoals project. The Forest Service estimates, moreover, that two-thirds of this Alaskan power, in sites or groups of 5,000 horsepower or more, can be economically developed for pulp manufacture at a relatively low unit cost.[2]

No other part of the United States offers a more promising opportunity for the development of a permanent pulp and paper industry. A large part of the forests belongs to the government. (Most of southeastern Alaska is included in the Tongass National Forest, and the Prince William Sound district is reserved as the Chugach National Forest.) This possession makes effective the general policy of the Forest Service, which, under its scientific management, guarantees a permanent supply of raw materials and a delivery of products when needed. Speculation and investment are thus reduced

[5] Report on Water Powers of Southeastern Alaska, Federal Power Commission, 1924, p. 6.

to a minimum. Finally, the operators are not forced to bargain with a host of different owners, to spend time and money in building up an operating unit or to solve cut-over land problems, for the government retains the title to the land and the Forest Service is *their* service.[4]

The Tidewater Position

The coast of southeastern Alaska resembles Norway's in its deep bays, its fiords and its islands. Like the coast of New England, a large part is submerged by the sea. Many valleys, gouged deeper in some instances by great glaciers, are occupied by the sea, leaving the higher mountain tops and hills standing out in a most bewildering confusion of sharp, jagged peaks and nunataks of varying height.

Labor

Except for capital, the principal human requirement of pulp and paper manufacturing is labor. This need will be met from several sources. The industry, like the saw-timber business so far developed in the region, will give some opportunity for stable employment to resident Alaskans who now work at fishing or in canneries during the summer but have little chance to find work during the rest of the year. Most of the skilled mill operatives and a large part of the wood workers, however, will be imported by the industry.[6]

Since construction from the ground up will characterize the development of pulp and paper manufacturing in Alaska, there is no reason why the latest instal-

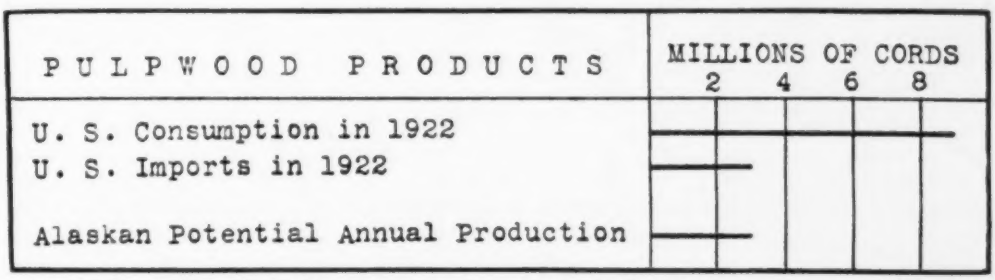


FIGURE 7.—Pulpwood used for paper manufacturing in the United States compared with imports and the Alaskan potential annual production. Imports and consumption include all grades of paper and woodpulp reduced to pulpwood basis. The most important grade is news print, about 60% of which is imported directly as paper. Only one-third of the pulpwood required for paper is obtained from domestic sources. Alaska is capable of supplying the deficit. (Data: U. S. D. A. Departmental Bulletin 1241, pages 23, 54.)

These waters make excellent harbors and the deeply indented, practically ice-free bays (note the temperature curve in relation to the freezing line, Fig. 4) are open throughout the year. This additional feature, indeed, favors the pulpwood industry. Fortunate is the enterprise which has tidewater, ice-free harbors, most of the timber on the lower slopes near tidewater, and mill locations within easy and cheap towing distances from adequate timber supplies. The contrast is significant when compared with the snow-bound, ice-locked pulp mills of the lower St. Lawrence region.

lations in the industry, good mill site locations, and scientific town planning cannot be employed. Up-to-date equipment advantageously provides industry with many types of machinery not in use by competitors long established in other regions; and a regard for social welfare, by laying out well planned towns organized from both workers' and employers' standpoint, usually results in establishing a reasonably fixed, efficient and contented population. The achievement of the latter consideration would not only

[6] U. S. Forest Service, Personal Correspondence.

increase the population of the territory by a permanent addition, but would also assure the Pacific Industrial Region of town development that is socially sound.

Market Relationships

An obvious asset of pulp and paper production is accessibility to market. British Columbia, Alaska's southeastern neighbor, ships pulp and pulp products to our Pacific Coast, Japan, and even Australia; and Norway markets similar products throughout the world. For Alaska, a position on the west coast is no A more important market is the United States, however, now importing two-thirds of her news print, the deficit of which might easily be covered by Alaskan output.

Obviously then, Alaska is impressive in her possibility of a permanent and profitable adjustment to her forest resources. Her raw materials are near tidewater, splendid water power sites are available, harbors are ice-free, rainfall is heavy and dependable, labor problems promise to be negligible, and her position is very advantageous for world markets.

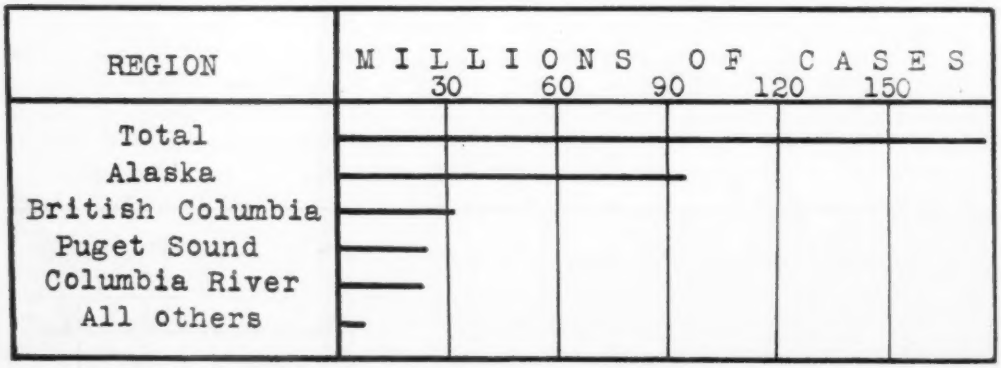


FIGURE 8.—Pack of canned salmon on the North American shores of the Pacific Ocean from 1866 to 1924. The exceptionally favorable position of Alaska in the salmon industry is the most striking feature. In the last fifty years, the territory has accounted for more than one-half of the entire production of the American Pacific. "Total" does not include 1920–1924 pack of item listed "all others." (Data: 1866 to 1919 from Bureau of Fisheries Document No. 902, pages 152, 153; 1920 to 1924 from private correspondence, Bureau of Fisheries.)

mean advantage, as the location faces wood-scarce China just interesting herself in forest policies and whose present consumption of about a quarter of a pound per capita is certain of increase.

THE SALMON INDUSTRY

The Salmon Industry of the Pacific Industrial Region has been a source of great wealth. The annual salmon pack

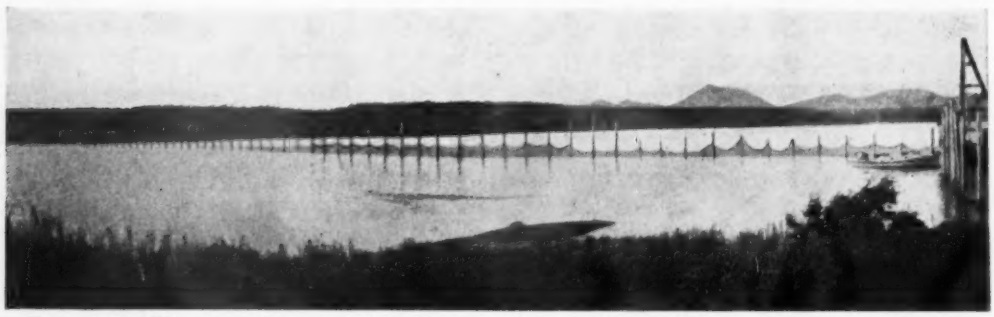


FIGURE 9.—Salmon rock across Wood River, Alaska. This interference concentrates the fish at selected openings. In open waters many types of apparatus and methods of fishing are employed. The purse seine is the most important method in use in the Alaska and Puget Sound districts. (Courtesy of U. S. Bureau of Fisheries.)

runs into the millions of pounds and millions of dollars.

The "Japan Current"

The warm North Pacific currents, sweeping eastward from Japan, turn toward the western coast of Alaska and bring in their waters a wealth of animal organisms and sea vegetation. Millions of fish accordingly abound, gorging upon this rich food supply concentrated along the continental shelf. King of them all, economically, is the salmon. Norway, of all nations the most dependent upon fish, has her cod and herring, but Alaska boasts the king salmon and red salmon, fish among the most valuable of the world.

No salmon fisheries on the Pacific Coast are Alaska's equal. During the past sixty years she caught three times this resource that its 1924 output exceeds by twenty-seven million dollars the corresponding value of gold, the mineral for which Alaska has so long been famous.

The River-Breeding Grounds

The fish spend the greater part of their lives, from two to five years and more, near the coastline of the neighboring sea and in its inlets, but fresh, salt-free water is required for breeding. In the spring the adults gather in huge schools or companies near the mouths of streams which are discharging their fresh, cold water into the sea. Some strange urge impels them to seek the headwaters and they fight rapids and leap high cascades to reach the little glacial lakes or upper stream reaches where, after depositing their eggs, they die.

FIGURE 10.—Salmon Cannery at Santa Ana, Alaska. These plants are scattered from southeastern Alaska to the Alaska Peninsula and the Yukon River. The history of the salmon industry is full of abandonments, consolidations and the establishment of new canneries, the variable runs accounting largely for this instability. This method of preservation is one of the most feasible in the salmon industry. From 2,500 to 4,000 cases a day are turned out by a well organized plant. Owing to the labor involved, the largest part of the operation is done by especially designed machinery. Sheet tin is commonly purchased and made into cans in the cannery. (Courtesy of U. S. Bureau of Fisheries.)

the quantity of fish produced by her nearest neighbor and competitor, the British Columbia district, and her present annual catch is more than three times this district's output. The famous Puget Sound and Columbia River regions are similarly outclassed (Fig. 8). So important is

The period of ascent initiates the time when many fish are caught for canning and artificial propagation (Fig. 9), but the season in some waters does not close before the middle of October. The yield of fishing grounds is extremely variable, although the runs are cyclic, a

large catch being realized every other year. This variability has made concentration of a large part of the operations in the hands of only a few companies or groups of companies advantageous, in that only large capital can absorb the local and periodic losses successfully.

Labor

The migrant workers employed constitute the most unfavorable aspect of the salmon industry. This population is neither permanent nor stable, a social contrast with the fixed pulp and paper peoples. Those engaged in fishing and canning are the chief classes represented.

The labor is gathered from large coastal cities as far south as San Francisco. The crews and canners leaving "Frisco" each March form a motley, colorful crowd. The historic windjammer salmon packing flotilla is being gradually replaced by steamboats, however, which make the journey in fractional time and promise to bring about new adjustments in the industry. White men do the greater part of the fishing, many nationalities being represented, but a number of Indians are also engaged. The native-born Americans are few in number, their participation in the industry being largely of a capitalistic nature. This class of people therefore has contributed little to the permanent population of the territory.

The racial problem of the canning labor is particularly acute, Orientals constituting the largest part of the labor so employed. Japanese make up the major percentage of this element, but there are many other nationalities, and in some canneries, special quarters have to be provided to prevent racial hatred from engendering brawls and disturbances.[7] While the industry employs a number almost equal to a fourth of the entire population, the composition, the nomadism and the method of employment are not quite favorable to the territory.

[7] Bureau of Fisheries Document 902, U. S. Dept. of Commerce, pp. 96–100.

Canned Salmon

The excellent harbors, which are so beneficial to the pulp industry, are also invaluable to the fishing industries. Their waters are not only the homes of these shiny, valuable fish but they also carry them canned. Canned salmon constitutes over seventy per cent (1924) of the value of the exports of the territory to the United States and the whole is world-wide in distribution (Fig. 10).

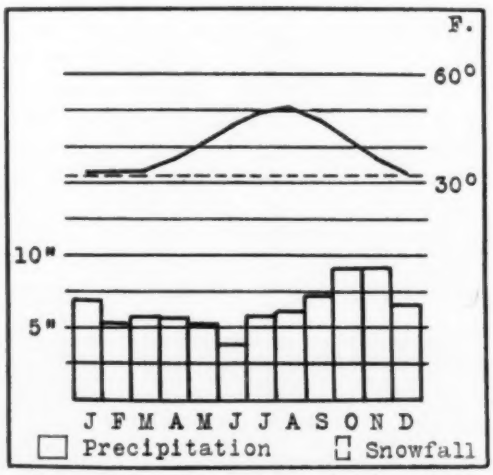


FIGURE 11.—Climate chart of Atka, Alaska. Lat., 52° 12′; long., 174° 20′; elevation, 15 feet. Precipitation in this island chain takes place on approximately 200 days a year in measurable quantity. Scarcely any snowfall data are available for this part of Alaska. The amount is not in sufficient quantity, however, to interrupt grazing for long periods. Navigation is open throughout the year. Data: U. S. Weather Bureau.

As a result of subsequent disposition in the United States, every food-consuming center—from the world's metropolis by the sea to the sleepy hamlet by the cross-roads—finds a place on its shelf for the red-labelled cans of these choicest salmon in the world.

THE INSULAR FUR PROPAGATION REGION

For centuries Alaska has been renowned for its wealth and variety of furs. It was the fur industry that drew the Russians to the land, and later justified America's purchase.

THE FOX FARMING INDUSTRY

The wild furs, still a source of considerable revenue to itinerant trappers, are decreasing in annual value of catch, but scientific, controlled production of fur is assuming greater importance with each passing year.

Mountainous Grass-covered Islands

Climate has dealt less kindly with the Alaska Peninsula and the Aleutian Islands. The winds sweeping across the cold Bering Sea currents carry their chill to the islands and the northern half of the peninsula. The climate chart of Atka (Fig. 11) presents an annual temperature curve strikingly similar to that of Sitka (Fig. 4), but many of the individual days have much lower temperatures, for the cold Bering Sea lying to the northward has a most pronounced influence. Only grasses and shrubs thrive under such severe conditions of which the heavy precipitation of the islands ordinarily produces an abundance. "Mountainous in extreme and largely of volcanic origin, the islands of the chain are absolutely devoid of timber, but their lower slopes are for the most part covered with a luxuriant growth of native grasses."[8]

The Aleutian Islands, moreover, are in many respects much like Ireland and Scotland, which lie between the same parallels of latitude and enjoy a similar moist climate. The Islands are not, however, a land of potatoes, pigs or oats. What small amount of soil is formed is fertile, but the frequent cloudiness and the comparatively low summer temperatures make vegetation, except native grasses, slow in growth. While snow occurs during the winter, the quantity is ordinarily not sufficient to interfere with grazing for protracted periods.[8] Few domestic herbivora, however, have grazed these islands. Wild caribou formerly ranged over one, but even there the grasses are practically uncropped. The vigorous growth may some time be utilized by sheep and other domestic stock, but today there is no land animal of importance larger than the fox.

[8] Summary of Climatological Data of Alaska, U. S. Weather Bureau, Sec. 3, pp. 1, 2.

The Blue Fox

The shores of the Arctic have given rise to one of the most interesting of the fox species, the blue fox, whose brown, sooty coat is underlain by a fine, dull blue fur. This tint appears in patches in the foxes of all regions, but it characterizes the entire peltage of the Aleutian Island breed and gives it the name, Blue Fox. In the cold winter, when other Arctic foxes change their coats to a snowy white, the Aleutian species puts on a longer, thicker coat of blue. The long, cool season with moist winds blowing from the cold Bering Sea, make his fur soft, fine and long, while the many days of fogs and mists, it is said, protect his delicate color from the strong, fading sunshine.

FIGURE 12.—Blue foxes running wild on Wingham Island, Alaska. These animals comb the beach for food and will become very tame, even eating from the hand of their keeper. The government herd is located on St. George Island of the Pribilof group. From 700 to 1,100 animals are now taken annually from this group of islands, St. George supplying the majority of the catch. (Courtesy of U. S. Biological Survey.)

The fox is a timid, nervous animal and is especially shy and irritable during the breeding season. Islands, therefore, are of prime importance in the physical seclusion they offer, their rocky coasts, coves

and recesses providing him with welcome shelter and isolation. The animals are free to run and so hunt a part of their own food which the native water fowl, birds and eggs supply. (Fig. 12).

This system of propagation duplicates, in some respects, the native life of the animal, and it is popularly assumed that the fox produced in the "wilds" has a superior pelt. Ranch organization, however, is also successfully employed. It fixes control in selective breeding and ultimately leads to standardization.

Ruthless trapping to supply the inordinate demand for furs throughout the world, has appreciably reduced the number of furbearing animals of the American continent, but Alaska seems destined to become a natural reserve from which the United States may derive a large part of her own supply of furs. Seventy-five years ago, the Russians, when Alaska was in their possession, passed rigid restrictions on the killing of blue foxes, hoping to stock the islands with these fur-bearing animals.[9]

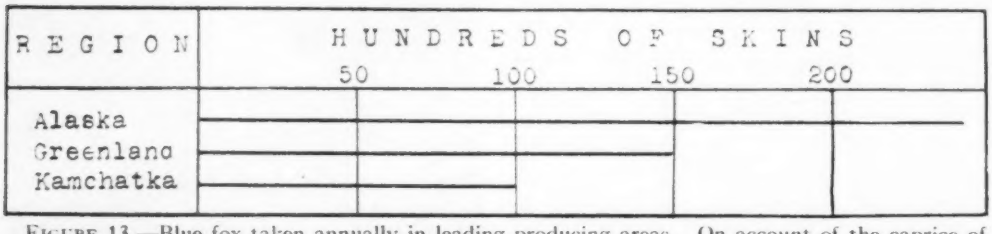


FIGURE 13.—Blue fox taken annually in leading producing areas. On account of the caprice of fashion, prices on blue fox skins have declined about 50% in the past two years, but prospects seem good for their return to popularity. (Alaska figure is for 1924, from correspondence with Bureau of Biological Survey. Greenland and Kamchatka estimated by Fouke Fur Company, St. Louis.)

The Fur Farm Islands

The colors of fox vary greatly—red, white, blue, black and silver—but, like the salmon among the fish of the Coast Mountains, the blue fox is the economic king fox. To date, the largest single group of islands producing him in this section is the Pribilof Islands, which lie to the north of the Aleutian Chain. These islands belong to the United States and have, under government ownership, what is probably the largest herd of blue foxes in the world. The greatest commercial development, however, has occurred in southern and southeastern Alaska. These divisions have three-fourths of the ranches in the territory. Since fish is the basic food in the diet of the mammals, the proximity of these sections to the canneries is a great advantage. The waste material from the industry is palatable, nutritious, and inexpensive. The many islands along the ice-free coastline of submergence are well suited to fox ranching, the freedom from ice bridging to the mainland being an important asset.

The relative significance of the industry is far more important to the Aleutian Chain, however, since it utilizes islands of little value to agriculture or forestry and represents one of the only commercial industries of importance for which the islands are suited. The demand is of such proportions that practically all the desirable islands under the control of the Department of Agriculture are leased for that purpose.

The Status of the Industry

The blue-fox farming advantages of these island masses stand out as one of the major assets of the territory. Other regions of the world, notably Greenland and Siberia (Fig. 13), produce blue fox peltries of high grade and, while those of the Cape York district of Greenland are said to be the finest produced, those of fur-famed Siberia are considerably inferior in quality to the prime furs of Alaska. A large part of the foreign catch has little

[9] Bulletin 1350, U. S. Dept. of Agriculture, pp. 4, 10.

FIGURE 14.—Fur seals on rookery, St. Paul Island, Pribilof group. This island is the "seal island," as St. George is the "blue fox island." The massing and great crowding on the bare rocky coasts is one of the most impressive and awesome phenomena. While the animals spend a large part of their time in the water, the land phase of the industry might well be called "seal farming." An annual census is taken, scientific care is extended, and a certain number of the male breeding reserves are marked by branding or shearing a patch of fur from the top of the head. (Courtesy of U. S. Bureau of Fisheries.)

industrial organization, many of the skins being obtained from wild sources. In comparison with these regions and other places yet to be evaluated as future seats for the industry, it is certain that the Alaskan source will command an impressive position.

THE FUR SEAL INDUSTRY

Thanks to wise policies of conservation and production, the fur seal industry, once threatened with extinction, has again developed into a source of animal revenue.

The Polygamous Seal

The chilly, barren Pribilof Islands, distinguished for their blue fox herd, are more important in another economic aspect because the fur seals, that spend their winters far to the south, use their bleak shores for summer homes. They are called fur seals, although the name is peculiar for a creature so markedly different from the hair, or true seal. The adult males, are called bulls and the females, cows; the newly born are neither calves nor cubs, but pups; the young males are bachelors. The shores to which the seals resort are designated rookeries; the family unit is the harem, the average size varying from forty to ninety cows per bull.

Seal Conservation

When these animals came under United States supervision with the purchase of Alaska, they represented one of the most valuable marine resources we had ever possessed. The strength of the herd was variously estimated at from two million to five million animals. Like all abundant resources, however, they suffered the most reckless exploitation. Forty years after the acquisition of the islands, when their numbers were reduced to one eighth of a million, they became the subject of one of the few international conservation conferences that have ever been successful. The United States, Russia, England and Japan, all of whom also own diminished herds in and near the same waters, agreed to prohibit their killing under any other method except the strictest government supervision.

The rocky beaches of these cold islands in the North Pacific have for centuries

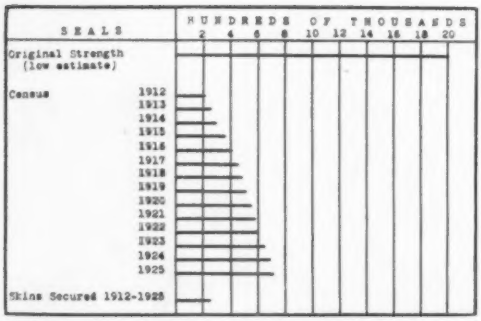


FIGURE 15.—The annual growth of the Pribilof seal herd. The increase is both gratifying and constant, although a certain per cent is taken each year for skins. The original herd has been estimated as high as 5,000,000 animals. With continued protection the animals should attain their original numbers within a few decades. (Data: Bureau of Fisheries.)

been the breeding grounds or rookeries of seals which, curiously, continue year after year to return only to these places (Fig. 14). Within two days of their arrival the cow gives birth to a twelve-pound, coal-black pup. The waters surrounding the islands are notably deficient in the fish life fed upon by the animals, and it is a remarkable habit which causes the seals to make their summer homes here, since they subsist chiefly on squid, herring, salmon and other small sea fry. The "Japan Current," however, which feeds southeastern Alaska, has also populated the waters of the Aleutian Islands with similar inhabitants. Ten or twelve days after the birth of the pup, the cow makes the first long trip to the feeding grounds, returning after three or four days to the rookeries. Throughout the season she continues to make regular visits every four or five days.

The Ravaging Hunter

Then came the great killing power of the rifle. In the hands of the improvident hunter, it threatens the doom of every wild animal prized for flesh, skin, horn or feather. Its death stroke slaughtered the buffalo and its bullets butchered the seal herd. It was not only customary for Indian and white man to

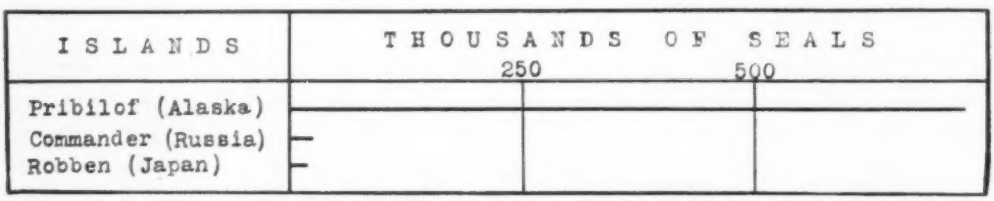


FIGURE 16A.—Comparative strength of seal herds in North Pacific Ocean. According to the Bureau of Fisheries, the Alaskan herd constitutes nearly 90% of all existing fur seals. Only three of five islands in the Pribilof group have seals at present—St. Paul, St. George and Sea Lion Rock. Commander Island is located at the western end of the Aleutian Chain and Robben Island is in the eastern part of Okhotsk Sea. Size of Russian and Japanese herds estimated. (Data: Bureau of Fisheries, private correspondence.)

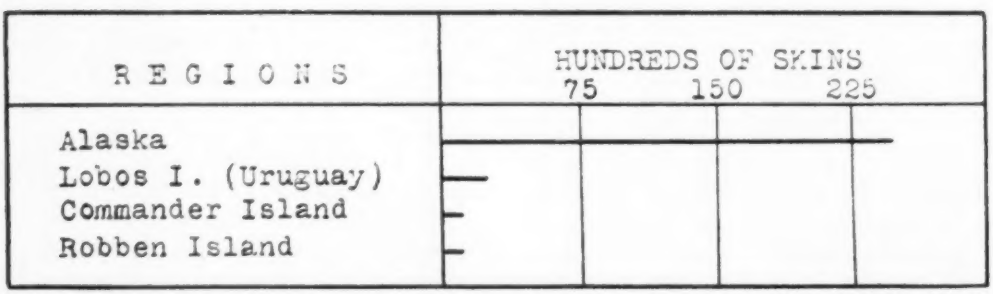


FIGURE 16B.—Average annual catch from leading seal herds. Alaska now has from 25,000 to 30,000 3-year-old males available for killing but not all of these are taken. The number shown is the quota approved for killing in 1923, but only 60% were killed. A herd located at the Cape of Good Hope is accredited to second place by the Fouke Fur Company, St. Louis, and is thought to yield about 8,000 annually. The balance of the catch shown is based on figures supplied by this company and the Bureau of Fisheries through private correspondence.

kill the animals migrating to and from their winter home, but they also intercepted the mother between the feeding grounds and the rookeries, with the result that not only she perished, and eight or ten future pups with her, but usually also the young pup on the island. The pup lives only on milk during the summer. With the loss of his mother he usually starves to death.

Today the fur seals enjoy full government protection and supervision. Only the young bachelors are taken, as the harem habits of these animals effect a large surplus of males annually. The herd is rapidly recuperating and by 1922 had nearly tripled its number (Fig. 15), although more than two hundred fifty thousand skins have been secured since 1910, when the last sealing lease issued to private corporations had expired.[10]

The Seal Furs

So successful is the management of the government that the quality of the seal is the best of all existing fur seals in the world.[10] The most serious drawback to the more rapid growth of the seal herd is the large natural mortality of the animal. Naturalists studying the problem have estimated that only fifty per cent of the animals survive their third year, and some authorities state that the killer whale is the greatest natural enemy of the creatures (Fig. 16).

The skins are sent to St. Louis for dressing, dyeing, and sale at public auction. This city, the largest primary fur market in the world, not only receives the majority of the seal skins and all the United States Government blue foxes taken on the Pribilof Islands, but also a considerable proportion of the seal skins from other herds and blue foxes from all parts of the world. St. Louis then sends them to New York, the largest consumer of dressed, dyed and finished skins in the world, and to Chicago, which probably ranks second in the United States as a style market for these commodities.

[10] The Fur Seals of the Pribilof Islands, Alaska, U. S. Bureau of Fisheries, October 1925.

THE CENTRAL AGRICULTURAL REGION

Agriculture is never likely to become the dominant Alaskan industry but in the central plateau and in the sheltered mountain valleys it will certainly be significant.

THE SCRUBLAND RESERVES

A pauperate forest growth occupies much of the Central Agricultural Region.

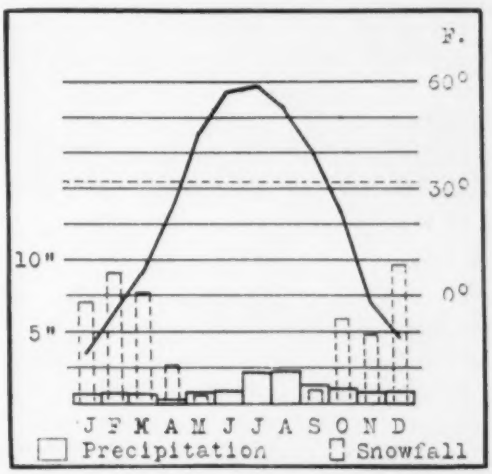


FIGURE 17.—Climate chart of Tanana, Alaska. Lat., 65° 10′; long., 152° 06′; elevation, 220 feet. About 25% of the precipitation occurs as snow. The summer temperatures are delightful, being warm enough for comfort but not oppressively hot, although temperatures between 80° and 90° occur each summer. The winters are cold but not unbearable. Out-of-door operations are naturally restricted, but children attend school throughout the winter. In 17 years of record at Fairbanks, four Januarys and one December had temperatures of zero or lower on each day. Data: U. S. Weather Bureau.

It can never become important in a lumbering industry although it may supply much pulpwood.

The Cold Semi-arid Climate

The great interior plateau of Alaska, which is nearly one third more extensive than the piedmont country of Eastern United States, is a huge rolling upland mantled with grass and woodland. The broad Coniferous Forest Belt of Canada, sweeping northwestward along the eastern mountain front of British Columbia, enters Alaska through the Yukon-Tanana gateway, but the stately trees of the south are so shrunken and shriveled at

FIGURE 18.—Clearing land on a homestead in the Birch Hills section near Fairbanks. Such clearings are ordinarily used for homesteads, the forest supplying fuel, lumber and other building material. (Courtesy of U. S. Bureau of Soils.)

the north that less than one-half of this huge "forested" area of eighty million acres in Alaska has timber of sufficient size for either cordwood or saw logs. The climate chart (Fig. 17) explains this feature so markedly different from that of the heavily forested division, the Pacific Industrial Region. The sharp rise and precipitous descent of the curve speaks of enormous contrasts between winter and summer temperatures—conditions too cold for broad leaves and too low for large, dense tree growth. The average winters and summers, however, are only five to ten degrees colder than Winnipeg, the outline of the temperature curve of which it most nearly resembles. Surrounded by water on all sides except the east, the narrow peninsular form of Alaska gives it a relatively small land mass, as compared with the huge American continent.

Small Trees and Forest Fires

The low rainfall is also unsuited to large heavy forest growth. Its semi-aridity is alleviated by the summer precipitation and by the high latitude

FIGURE 19.—Field of barley near Fairbanks. Almost all varieties of barley mature earlier than wheat and oats, and the crops are essentially dependable, according to the Agricultural Experiment Station, even in adverse seasons. (Courtesy of U. S. Bureau of Soils.)

position with its resultant low evaporation. Shrubs, saplings, woodland and small trees are quite common, and large tree growths occur in some of the foothills, along many streams, and in similar favorable situations in the lowlands (Fig. 18), but regionally, saw timber is not plentiful. Moreover, the scanty rainfall of interior Alaska has furnished ill protection from fires, and these areas have suffered ruinous destruction which the Pacific Mountain Forests with their drenching rains, heavy snows, and soggy underbrush have completely escaped.

Pulpwood or Animal Sanctuary?

This "forest" region does not offer a basis for a permanent lumber industry. Tree growth is slow and species tend to be small in size. What tree growth there is offers pulpwood possibilities, but lack of power and relative inaccessibility to market is a serious handicap. Furthermore, the world has many areas of good rainfall and rapid tree growth, superior for permanent pulp and paper industries. In fact, the use of these scrublands for pulp should be deferred indefinitely. They are useful for local firewood and building purposes, but, like the tundra and other northlands, they play a more important rôle in the animal world. It is not only the habitat of numerous fur-bearing animals but also the summer home of many migrant birds from the South and the winter resort of many other species from the far North. There is reason to believe that its destruction will reduce seriously the useful birds and mammals, or even cause the total disappearance of many beneficial forms. Conservation is teaching the cost of unnecessary interference with the established plans of nature. Untold effort, time and money have been wasted because man has often acted in complete ignorance or disregard of the interrelations between the many aspects of plant and animal life.

THE LIVESTOCK INDUSTRY

It is likely that Alaskan agriculture will always be closely associated with the raising of livestock. Rigorous climatic conditions and distance from market preclude the possibility of a widely-developed crop agriculture.

FIGURE 20.—Cutting grain for hay on the Tanana bottoms. The short growing season favors the production of crops suitable for the animal industry. (Courtesy of U. S. Bureau of Soils.)

The Cold Arctic

Fifty-nine years ago, when Alaska came into our possession, no one was interested in her agricultural resources. She was worthless, an extreme marginal land, derisively dubbed "Seward's Folly," by the opponents of the administration, particularly of the Secretary of State. Her extreme northerly position was generally accepted as conclusive evidence of her non-agricultural possibilities.

New standards are now employed in evaluating Arctic, desert and tropic lands. In fact, all lands formerly classed as worthless or uneconomic are now recognized as "good for something." The new attitude is a natural result of (1) an increasing population which has "multiplied," "filled the earth," and is seeking new

resources for its children; (2) an aggressive scientific research, seeking to discover and appraise correctly every fact of the universe.

Central Alaska is not by any means the coldest, the snowiest nor the iciest land of the earth. The highlands are cold, but the Central Plateau seldom rises above four thousand feet, and much of it is less than one half that altitude. Great land masses in high latitudes are also cold, but Alaska is a small land area bordered by the sea on three sides. Heavy snows occur in regions of high precipitation, but the rainfall of central Alaska is not only low or semi-arid, but it also comes largely in the summertime when snow is climatically unusual. In fact, this section has no more snow than Winnipeg in the heart of the Canadian Wheat Belt. Furthermore, what snow does fall (about one fourth of the precipitation occurs in this form) is really prized by the agricultural folk of the region, as it furnishes a protective covering to the ground and a spring moisture that augments the light summer rain.

The Growing Season

The ultimate economic worth of agricultural lands, granted adequate rainfall and favorable temperatures, is the length of the growing season. Reckoned in days, central Alaska has a short growing season, most weather observation stations reporting less than one hundred frostless days annually, while yearly records show minima of sixty to seventy-five days. The true value of a growing season lies not in the number of frost-free days, however, but in the total hours of sunshine occurring above 42.6° F. during that season. Experiments conducted by the United States Department of Agriculture show that plants subjected to short daylight periods grow slowly, mature late, and form seed reluctantly even though all other climatic conditions may be favorable.[11] Reversed light conditions accelerate movement in the opposite direction. Plants living in tropic lands, with relatively long daylight periods and the growing season never ended by frost or lack of rain, grow quickly, become "ever-blooming" and make heavy vegetative growths.

[11] Agriculture Yearbook, 1924, pp. 387–389.

The Midnight Sun

The Central Plateau falls both within and without the area of the Midnight Sun. While Texas has but thirteen hours of light daily in mid-summer, this division has twenty and twenty-four hours. Plant life, therefore, becomes mushroom-like in development. It grows and matures with surprising speed. With the inauguration of the long daylight periods, vegetation develops so rapidly that one writer has said, "When spring approaches, it comes with a shout."

Animal Agriculture

The agriculture of Alaska will be characterized by animal industries. Two determinants so decree, (1) the position of the territory, and (2) the climate of the region.

The position of Alaska results in commercial isolation for its central uplands. Lying at the northwestern edge of the North American continent, it is located upon a branch line of ocean commerce. Furthermore, the great mountain wall along its southern margin cuts off the central region from easy market outlets, and necessitates the conversion of all agricultural products destined for outside markets to those of high value and easy carriage. Animals and animal products are agricultural commodities which lend themselves well to these requirements.

The climate, moreover, also conspires to make man an animal husbandman, for it limits agriculture to crops of which the major part of the production is best utilized by animal industries. The crops are oats, barley, rye, roots, alfalfa, and natural hay, the characteristic crop association of cool, semi-arid agriculture. Only one grain, spring wheat, is a large acreage crop which can be successfully grown for direct human consumption. Otherwise, barley (Fig. 19) takes the place of corn in middle latitudes; oats and alfalfa are

the cultivated hay (Fig. 20) and forage crops; winter rye, sown with peas and vetch, is the pasturage;[12] and roots and natural hay are the accessory feed crops.

New Animals

The far northern position of central Alaska results in conditions that are severe for most of the animals domesticated by man for middle and low latitude environments. The development of a livestock industry, therefore, demands either the evolution of new varieties and types of animals adapted to the rigorous local conditions, or the domestication of resident species. For the derivation of new varieties, two classes of animals, dairy and meat types, present themselves as possibilities; and for domestication, wild sheep and goats and caribou.

The most suggestive dairy animal bred to meet Alaska conditions is the Galloway, of which the hairy coat has been developed by years of outdoor life in cool Scotland. The breed is not a good milker, but crossed with Holstein-Fresian, its sturdy rustling qualities are transmitted to cows whose yield and butter-fat content of milk are intermediate between the pure-bred cattle.[12] In the meat varieties few animals have been run on the open range all winter, owing to the severe conditions of that season, but no stock offers more favorable breeding qualities than the burly Asiatic yak (Fig. 21) which the harsh plateaus of Tibet have provided with bulk, shaggy coats and extreme resistance. Sheep, goats, alpaca and similar long-haired and long-wooled ruminants present breeding material for these types of animals, but more interesting possibilities exist in the domesti-

FIGURE 21.—Two heifer cattleyak. Dam lying down, yak sire in background. Wainwright National Park, Alberta, Canada. Both Canada and Alaska have taken up the crossbreeding of yak and domestic cattle. (Courtesy of U. S. Dept. of Agriculture.)

cation of bands of local wild sheep which brouse on the sparse vegetation and are adapted by nature to the vicissitudes of the climate.

An Undeveloped Reserve Region

Conditions, then, seem to call for the pursuit of the animal industries, but their actual development is far from realized at the present moment on any but the most modest scales. The Central Agricultural Region, with a maximum count, has a scarce three hundred farms, most of which are still confined to valley situations where

[12] Report of Alaska Agricultural Experiment Station, 1923, pp. 6–13, 23–25.

water for man and beast is easily obtained. Large tracts of the interior are unmapped, unoccupied, and public-owned. Most of the region is still "forest" or scrubland, and a large part of the land cleared for farming is associated, for market purposes, with the mining and other small industries operating in the territory. Like the balance of Alaska, the region is only "in the making," although experiment stations and other agencies are performing a most commendable pioneer service in working out the detailed scientific facts upon which an orderly industrial development in a new land alone can rest.

Other areas in the world, under present economic conditions, are more favorably located with reference to climates suitable for the animal industries and to industrial regions consuming animals and animal products. The all-important outside market to whose favorable nod every large industry the world over is subservient offers little to Alaska at present. Finland, to which this part of the territory has often been compared, has an outlet to the industrial countries of northwestern Europe. The corresponding region on the American North Pacific Coast is still in its infancy, however, and the central region of Alaska, to parallel Finnish success, must wait for a larger expansion in this area. For outside trade the meat industry of the territory must serve in a reserve capacity.

The local demand furnishes the only immediately accessible outlet. This is small and insignificant, although the future is promising, since the growth of the pulp and salmon industries in the Pacific Industrial Region, the increase of fox farming in the Fur Propagation Region, and the development of the tundra lands to the west and north will bring increased population and a greater local demand for foodstuffs. Under this situation, the acreage in wheat and subsistence crops will probably be stretched to the limit.

A Peculiar Region

A comparison with Finland, however, is difficult, owing to significant differences in physical conformation and natural resources. In fact, no country in the world offers conditions adequately comparable for economic development to those of central Alaska. The north-south mountain axis of the Fenno-Scandian Peninsula permits Finland to look southwestward into open water, but the high Pacific Mountains of Alaska run east-west along the southern margin and expose its central region to the chilly Bering Sea. Finland thus has easy access to the great industrial markets of northwestern Europe, reached by easy transportation on land and sea, while the Alaskan Central Plateau lies behind a

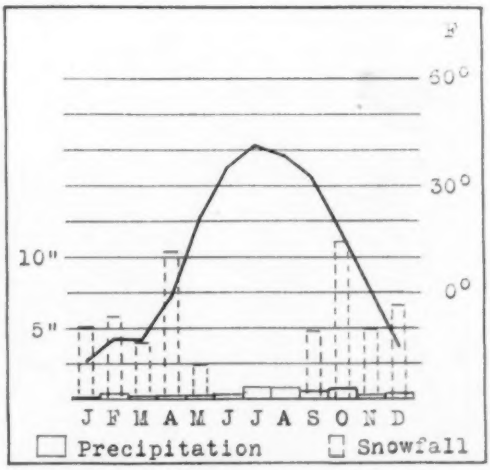


FIGURE 22A.—Climate chart of Point Barrow, Alaska. Lat., 71° 23′; long., 156° 17′; elevation, 20 feet. Freezing temperatures usually occur in each month of the year in the Arctic region and traces of snow are recorded in June, July, and August, but the cold of winter is not as intense as in the upper Yukon. Navigation, as a rule, is confined to August and September. Data: U. S. Weather Bureau.

mountain barrier, is two thousand miles from the North Pacific Industrial Region of the United States, and the journey from farm to seaboard, in terms of modern transportation, is long and difficult. Invaded by the Gulf of Bothnia on the west and washed by the Gulf of Finland on the south, Finland, furthermore, has a higher summer rainfall and a warmer fall, winter and spring. The topography is a lake-dotted, marsh-flooded lowland terrain, most of which is covered with

woodland and forest growth, while central Alaska is a rolling upland shut in on the north and south by mountain ranges and covered with scrub growths.

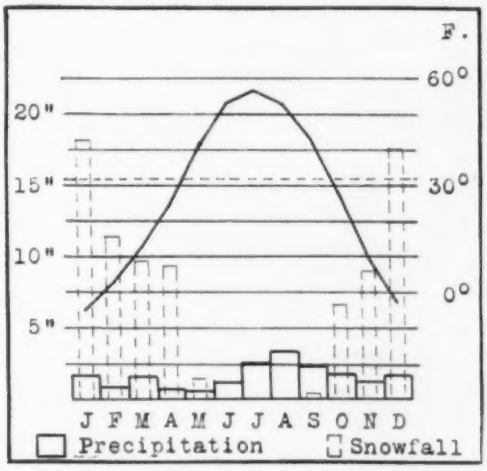


FIGURE 22B.—Climate chart of Holy Cross, Alaska. Lat., 62° 16′; long., 159° 50′; elevation, 50 feet. This station, with a much higher precipitation and average monthly temperatures, shows the influence of a more southerly position along the Bering Sea. Data: U. S. Weather Bureau.

Five months in Finland, May to September, have average temperatures above the minimum ecologically favorable for plant growth, but Alaska has only three months, and, with the exception of June and July, the temperatures of these months are from two to seven degrees cooler. As a result, growing possibilities are necessarily quite different in the two regions under consideration. From the forest viewpoint, Finland's wet lowlands support growths whose annual crops of wood and saw timber account not only for one-twelfth of Europe's production, but also for a very large per cent of Finland's exports. In an agricultural way, the grain and forage output is so great that Finland is renowned for dairy products, a large part of its farm crops being sent to market in the form of butter, cheese and milk.

The Fur and Livestock Farmer

The Alaskan farmer is primarily a stockman. His farm holdings are large rather than small, for, like all regions of low rainfall in which peoples are dependent upon animals, large acreages are necessary. His farmstead is a composite of (a) fields of grain and roughage, (b) blocks of pasture lands and hay fields and (c) an assemblage of silos, barns and feed lots. In the winter, unlike the Finnish farmer who is then a lumberman or a factory worker, he must turn to fur farming—an industry of unlimited possibilities in cold northlands like those of Alaska. As in most of the semi-arid farming districts, his crop production has elements of hazard, and the risks are not essentially different from those of

FIGURE 23.—Reindeer on winter range. Along the coast, the depth of snow is not a serious factor since the strong winds cause drifting and a part of the area is usually not deeply covered. On account of the fly and mosquito swarms, the animals are commonly pastured on the best wind swept regions in summer. (Courtesy of U. S. Biological Survey.)

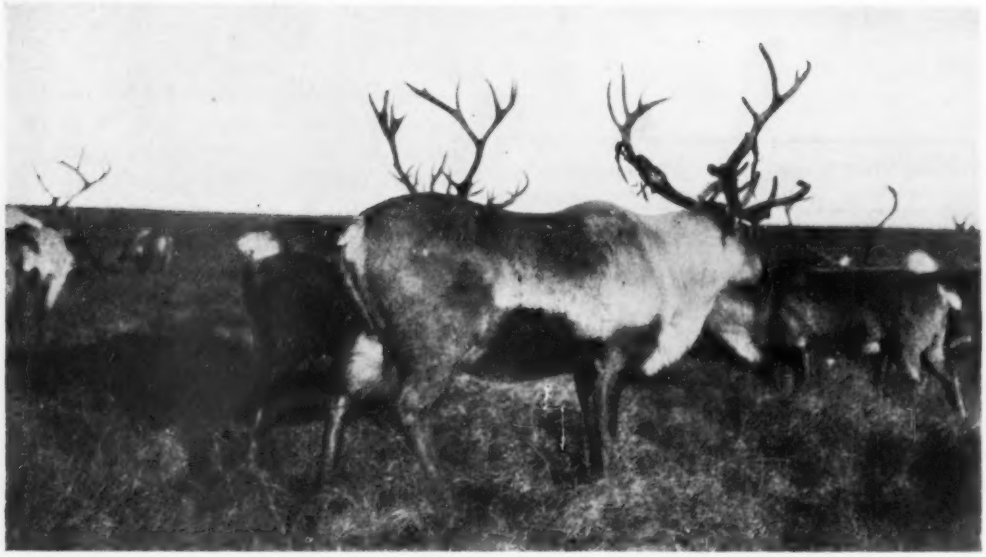


FIGURE 24.—Reindeer steer. A well-built blocky type of meat-producing animal. Such reindeer are less numerous in the herds than one would desire. By selection of breeding stock they can be made to predominate and will add greatly to the meat output. (Courtesy of U. S. Biological Survey.)

many agricultural regions in the United States. Crops in Kansas suffer injury through droughts, hot winds, cloudiness, wet weather or killing frosts, while deficient or excessive precipitation, lack of sunshine or early frosts are recognized rains.[13] Forage crops, however, are always dependable.

THE TUNDRA PASTORAL REGIONS

As in Eurasia the Tundra Region bids fair to become a land of pastoral nomad-

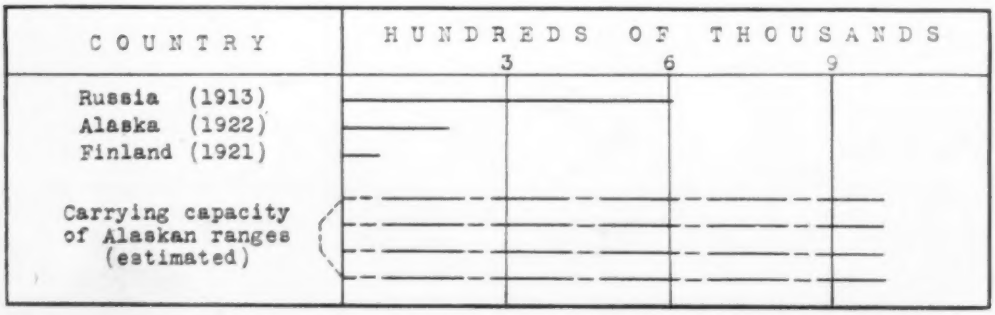


FIGURE 25.—Comparison of reindeer herds. For a long period no whites except the Laplanders owned reindeer but now more than one-fourth of the animals are under white ownership. The need of scientific research, as in other branches of the modern livestock industry, resulted in the establishment of a reindeer Experiment Station. Large scale organization is necessary to expand the industry in a commercial way to early sizeable proportions. The animals require about three years to reach full growth. The application of the principles of deferred and rotation grazing will not only permit a maximum of grazing but also a natural constant reproduction of the forage crop. (Data: U. S. D. A. Bulletin 1089 and Agriculture Yearbook, 1924.)

causes for yield curtailment in the Yukon. It is a matter of extreme irony that the first crop failure on record in this cool semi-arid region was due to excessive

ism, in which the reindeer is destined to be the dominant factor.

[13] Alaska Agricultural Experiment Station, Circular No. 1, p. 14.

THE REINDEER INDUSTRY

Fringing the Arctic Ocean and the Bering Sea is a long strip of lowland country, the "true north" of Alaska. These flat, monotonous lands are typical coastal plains composed of mud, sand, gravel and sand dunes. With the Brooks Range and its northern piedmont these lowlands constitute the great "barrens" of the Tundra Grasslands.

The High Latitude Lowlands

Like the Yukon, the grasslands are in a high latitude, and winters are correspondingly cold. Lowlands, however, make up the largest part of the region and approach sea level on their margins. They are, therefore, adjacent to large bodies of water, the Arctic Ocean and the Bering Sea, but their precipitation is light and aridity follows, the yearly precipitation varying from five inches at Point Barrow to fifteen inches along the Bering Sea lowlands[14] (Fig. 22).

The Vegetative Covering

This region is but moderately mantled with snow and that, as in the Yukon, occurs only in winter. With the coming of spring, the warm temperatures melt the snow, driving it into a thousand little ponds and lakelets dotting the lowlands. The soil thaws and opens and hundreds of flowering plants of the most brilliant colors spring into being under the long day. Mosses and lichens there are, too—several hundred varieties of each—but the flowering plants not only outrank them in species but bury them alive in tonnage. For every ton of mosses and lichens there are ten tons of flowering plants and these plants have the advantage of rapid recovery. Grasses and sedges grow afresh each year but certain lichens cropped by plant eating animals require many years to replace themselves, only to suffer the same fate over again.[15]

[14] Summary of Climatological Data of Alaska, U. S. Weather Bureau, Sec. 3, pp. 1–4.

[15] Stefansson, Vilhjalmur, "Northward Course of Empire."

A Wet Swampy Surface

When the spring sun moves northward in this land, driving before it the blizzards of winter, summer suddenly advances and the air is filled with an army of the hungriest mosquitoes imaginable. Mothered in the swamps, lakes and boggy soil which the sun has thawed, these insects fairly devour every animal and human being, within reach, not endowed with the toughest of hides or thick sweltering clothes through which the drills of the mosquito cannot penetrate. Later in the summer there are sandflies which get inside one's clothing and crawl all over the body. The only escape is to wear such tight fitting clothes that the insects cannot crawl under them—a very pleasant prospect with the temperature around seventy degrees!

Although the growing season with the full midnight sun is long enough to mature small fruit crops under favored conditions, and wild berries and wild vegetables grow in great abundance, this region is poor for agriculture, as the land cannot be plowed. Lucky is the man, Stefansson says, who can walk one mile of three in the direction he wants to go, for the abundance of lakes, swamps and marshland.

Enter, therefore, the ranch, the reindeer and his brother, the musk ox. Nature has given these animals large, broad hoofs which make excellent "mud shoes" for getting over the boggy ground of summer; which serve admirably for scratching away the snow covering the dead grasses and mosses of winter (Fig. 23).

The Eskimos

The Tundra Grasslands are the peculiar home of the Eskimos, who make up one-fourth of Alaska's population. They have lived there for years, hunting the caribou, the rabbits and the wild ducks in the tundra and catching the true seal and the walrus in the ocean. In winter they live in snow houses but in summer, in tents made of skins.

We have the most polite habit of thrusting our civilization on peoples who are

better off when left alone. The Eskimo also has been a target for our solicitude. In Stefansson's words, the Eskimo "considered fur clothes entirely satisfactory, and nearly everyone had at least one complete new suit that had never been worn," but we did not consider him "emerged from this savage state" until he "became thoroughly dissatisfied with his country and conditions, and learned to complain to us, in broken English, about his inability to buy canned goods and ready-made shoddy clothing in the quantity he desires."

The rifle—like the seal killer of the Bering Sea—did the rest. The Eskimo Indians, who were almost the sole inhabitants of the tundra, learned to shoot, and a few white men helped. Together they so thoroughly cleaned out the wild caribou and native game of the interior that the Eskimos, deprived of their land-food, and driven to the sea coast for sustenance were slowly diminishing in numbers, starving and freezing to death in the "civilized" homes which the white man had taught them to build.

But, thanks to Reverend Sheldon Jackson, fortune smiled again upon the Eskimos. He saw the possibility of using this vast grassland and thirty-three years ago, Captain Healy, under the direction of our government, secured sixteen head of reindeer from the reluctant, superstitious Siberians who feared to release a single animal to the white strangers. Later, twelve hundred more reindeer were obtained, and today the Alaskan herds number over a quarter million, although thousands have been killed for food and skins.

The Reindeer Ranches

These animals promise to turn the tundra into a vast ranchland. They double in numbers every three years. Four years' apprenticeship makes an Eskimo a full fledged herder in charge of his own animals, a flock of thirty-four.[16] No animal which man has domesticated within historic times is better adapted to his environment than this fellow. Our cows need care, barns and crops, but the reindeer is at home in a snowstorm, contentedly eats the food of his clime, and needs very little care, as 1,000 to 1,500 head are easily handled in one band.

The future of these animals, remarkably self-supporting, is interesting. Like the steer of our southwest ranges, each head requires about thirty acres annually, and it has been estimated that the vast tundra grasslands of Alaska can support twenty times their present number—a herd approximately equal to the beef cattle which Texas has today. What scientific grazing and the feeding of hay

FIGURE 26.—The musk-ox in his native environment. Photo taken between Artillery Lake and Great Bear Lake, N. W. T., Canada. In spite of his formidable appearance, the musk-ox is naturally mild and gentle. Under domestication, he is not unlike native cattle. His domestication possibilities are further favored by his tendency to remain indefinitely in areas where food is available, as he is not a migratory animal. He has a preference for grass, but where this is not available, lichen, mosses and willows are readily consumed. (Courtesy of Natural Resources Intelligence Service, Dept. of the Interior, Canada.)

[16] Bulletin 1089, U. S. Dept. of Agriculture.

and tame forage grown in the Yukon Basin, what cross breeding (Fig. 24) with the sturdy wild caribou, whose carcass dresses three hundred pounds of meat to the one hundred and fifty of the reindeer, will offer, is only suggestive of the industry.[17] So rapidly have the Alaskan reindeer multiplied that they are gaining rapidly over all other lands in numbers and are challenging the great Russian herds, their only big competitors (Fig. 25), for first position.

FIGURE 27.—Round-up herd at Norton Sound. When rounded up, even in the open, reindeer crowd into a compact mass like sheep. Their early domestication saved them from extinction at the hands of the hunter. As is the case with many herds in regions of poor transportation, the animals are driven to market. (Courtesy of U. S. Biological Survey.)

The Musk-ox

The musk-ox (Fig. 26) or ovibos, as Stefansson prefers to call him because "musk," in the modern sense, is misleading, provides meat that is most excellent. This beast, once a wild inhabitant of Alaska, but wiped out many years ago, can be introduced from neighboring northlands. He is easily domesticated and has three advantages over the reindeer—he is larger, he is wolf-proof, and he has wool which makes a fabric of the softness of cashmere.[15] Like the reindeer, he is a complete factory for the Eskimo, as he has meat, hide, milk and power. He will not only pull a load, but he can also carry a pack. He is aptly called "the camel of the frozen desert."[18]

A New Meat Supply

For the white man the reindeer and musk-ox mean another food capable of augmenting the increasing scarcity of meat. Reindeer are already performing this service. The animal, which resembles the sheep in its flocking tendencies (Fig. 27), cattle in its grazing habits, and the horse in intelligence and activity, offers to the world a new dietary item. Nine years ago the reindeer appeared on our markets and twenty years hence Alaska will send us annually thousands of animals. Hundreds of tons derived from Lapland are sold each year in Stockholm, Sweden, at prices very close to the corresponding cuts of beef. The Alaskan shipments to the United States are limited in part by present demands and in part by the cold storage facilities of steamers running to Nome and other coastal points. On the coast deep layers of permanently frozen earth and underground ice offer natural cold storage facilities readily available by digging a simple pit,

[17] Bulletin 1089, U. S. Dept. of Agriculture.

[18] Lomen, J. C., National Geographic Magazine, Vol. 36, No. 6, pp. 538–556.

now surprisingly little used. Twenty to sixty cents per pound is the remarkable New York price considering its novelty, the cost varying with the choice of cuts. Prosperity is truly dawning for the sturdy Eskimo. The Northern Ice Desert of Alaska, like the great American desert of the West, is disappearing.

MINERALS

Alaska was once spelled in gold and mineral wealth, but the importance of these resources is gradually shrinking not only in quantity and value but also in ratio to growing permanent wealth. Economically, Alaska is slowly passing the mineral stage of development with its familiar transitory exploitive characters, and is knocking at the agricultural and pastoral door of the world.

The Decline of Gold

Gold is widespread in the territory and its production has been equally extensive, the areas of outstanding interest occurring in the Nome district, the Yukon Valley and the Pacific Industrial Region (Fig. 2). Most of the metal has been won from cheap placer mining, the process of washing out the heavier gold from the sand and gravel which move away in running water (Fig. 28). In the Yukon and Nome districts the summer emphasis of rainfall, over half of which occurs from July to September, has been most favorable for this phase of the industry, although in years of low rainfall the streams do not furnish enough water for sluicing.[19]

FIGURE 28.—Hydraulic Mining along Canyon Creek, Cook Inlet, Alaska. A quarter of a century has passed since thousands of prospectors rushed into Alaska with pick, shovel and pan—the first crude but easily portable tools employed in placer mining by the individual. Tales of hardship may still be heard from the surviving participants, many of whom returned to the United States when the bonanza claims declined. The equipment shown is that employed by capital in a proven field of lower quality. Water under pressure is used to loosen, machinery employing the simple principle of gravitational selection. The rush to the new gold fields of the Red Lake District, northeast of Winnipeg, is a current reminder of this century-old quest for sudden wealth. (Courtesy of U. S. G. S., Dept. of the Interior.)

The trend of the annual production shows the usual sporadic character attendant upon the development of this metal (Fig. 29). Nineteen years ago it reached its peak and the decline since that time is

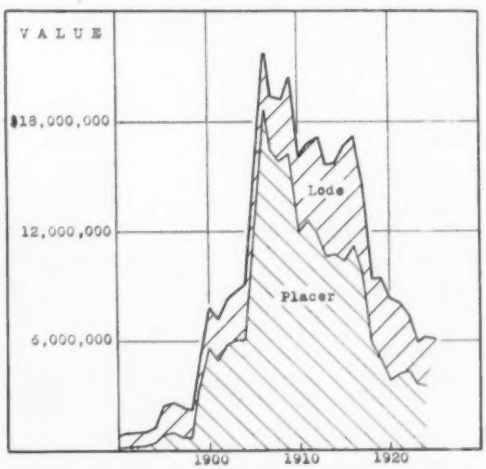


FIGURE 29.—Annual production of gold in Alaska. Placer gold has comprised the bulk of the output, but since 1910 the relative position of lode gold has been gradually increased. This shift is the normal history of most gold producing regions. (Data: U. S. G. S. Bulletin 773-A and correspondence.)

significant. During forty-four years of operation, combined lode and placer methods have yielded more than a third of a billion dollars worth of gold. The fact that this sum is no more than equal to the combined corn crop of Iowa and Wisconsin (1924) is suggestive of its relatively small importance. Various authorities place the future reserves at one-half that quantity to double the amount. Whether

[19] Bulletin 773, U. S. Geol. Survey, p. 25.

FIGURE 30.—A Kennicott copper development in the Copper River Basin, northeast of Prince William Sound. Owing to their lower value, copper deposits, unlike gold, are not ordinarily worked by individuals in a commercial way, but require large scale organization and equipment from the outset. (Courtesy of U. S. G. S., Dept. of the Interior.)

the gold of Alaska lasts until 1950 or 2000 A.D. is of no great significance. Not only has it served its day in returning the purchase price of the territory from Russia but it has repaid the cost nearly fifty times over.

Copper Production

Copper (Fig. 30) has been largely the product of the Pacific Mountain Division, where it is distributed among several districts (Fig. 2). In contrast with gold, its production (Fig. 31) is not decreasing, the youth and industrial value of the metal assuring its greater stabilization. All the copper mined in Alaska is equal in value to less than one-half of all the gold; or in terms of corn crops, the 1924 production of Missouri. Although longer lived, it is, like gold, a transition stage in the early development of the territory.

While these minerals will continue to be mined for years to come, and the mining industry is now being built up on a stable basis, their youth is spent and they have lost forever their dominating ratio to the more basic wealth of forest, fish, farm and reindeer. This declivity is the

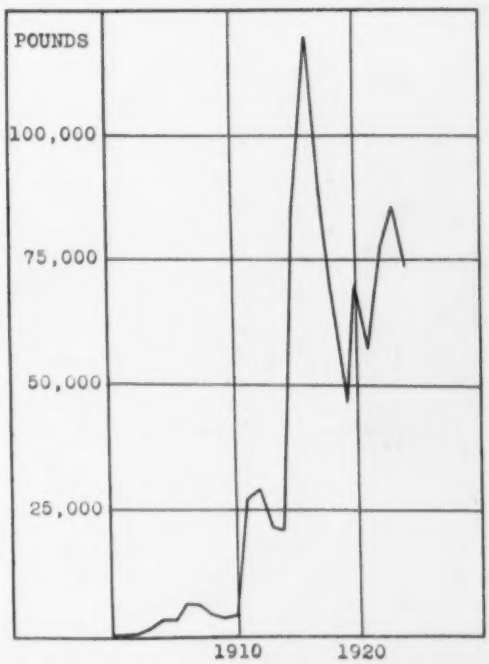


FIGURE 31.—Annual production of copper. This industry had its greatest boom during the World War. Low prices are given in explanation of the recent declines. The Ketchikan, Prince William Sound and Copper River basin are the outstanding districts. (Data: U. S. G. S. Bulletin 773-A and correspondence.)

typical trend of all new countries whose frontiers are opened through mineral exploitation. The fact that gold mining is gradually turning from placer to lode deposits and that the output of copper is largely dependent upon a favorable market price of the metal are but normal criteria pointing conclusively to the slow passing of the pioneer stage in Alaska's history.

The Promise of Coal

Coal, the modern basis of national power and industry, has in the past, unlike gold and copper, been of small total value. In forty-three years of mining, Alaska produced only one-fifth of the coal she consumed (Fig. 32). She has, however, fair reserves, and the low production in the past is an added finger pointing to her precious mineral exploitation stage. The reserves which are approximately equal to the French deposits are suggestive of her future possibilities. While the beds are widespread, only two of the economic regions have noteworthy deposits. The Lisburne Peninsula has both anthracite and high-grade bituminous coal near the coast. While the quality is good, coal is of little value to the reindeer industry and beyond local use, its only future appears to lie in outside commerce.

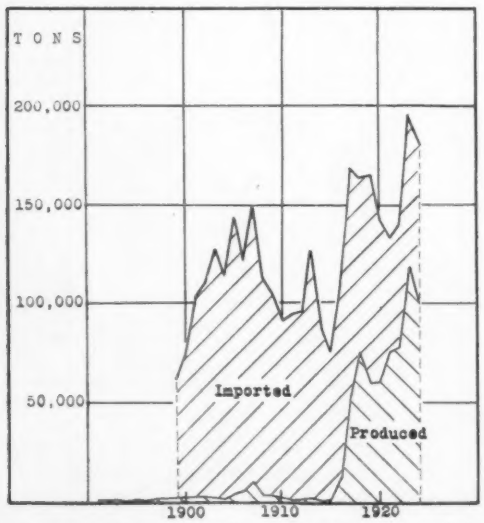


FIGURE 32.—Annual consumption of coal in Alaska. Until 1916, coal mining in Alaska was insignificant owing in part to restrictive legislation and in part to market conditions. The future seems to favor a large expansion in the industry, however. Figures are not available on imports before 1900. (Data: U. S. G. S. Bulletin 773-A and correspondence.)

The other coal fields occur in the Pacific Mountains. These fields, the Bering River and Matanuska, are the areas of greatest economic importance. Their high grade anthracites are the only coals on the Pacific Coast suitable for our navy. In addition, there are good coking, blacksmith and bunker coals, although the major portion of Alaska's coals are sub-bituminous and lignitic types (the Cook Inlet fields). If Alaska is capable, nevertheless, of producing the coal in the future, she has a market open to her equal to ten times her present output, the success of her competition with established developments from other sources depending largely upon the cost of production.[20] Her reserves of anthracite and semi-anthracite alone are large enough to supply this quantity until 3500 A.D.—fifteen centuries hence—should she be able to mine it to the last ton. The fact that some of these beds are badly folded and broken, however, adds proportionate costs to their market value.

DEVELOPMENT

The future of Alaska depends upon the intelligent development of her great resources, adequate to form the basis of industry and wealth for a large population.

A Region of Sparse Population

The permanent resources are capable of supporting a population of moderate density, but as yet no large possession of the United States is so thinly peopled, even Nevada, the state of minimum density, possessing seven times the number of people per square mile. In fact, the territory bids fare to rank with the most scantily populated land of the earth having political organization. The total population, widely disseminated, is no larger than that of Little Rock, Arkansas.

[20] Bulletin 442-J, U. S. Geol. Survey, p. 94.

The greatest concentration occurs in the Pacific Industrial Region, approximately sixty per cent of the inhabitants living in this section. Nationality is about equally divided between whites and Indians, the Eskimo stock composing one-half of the latter race. Urban development is confined to small towns, the largest of which, Juneau, the capital, has 3,000 people. The balance of the inhabitants is scattered in rural sections, hamlets, villages and towns, only five of which range from 1,000 to 2,500.

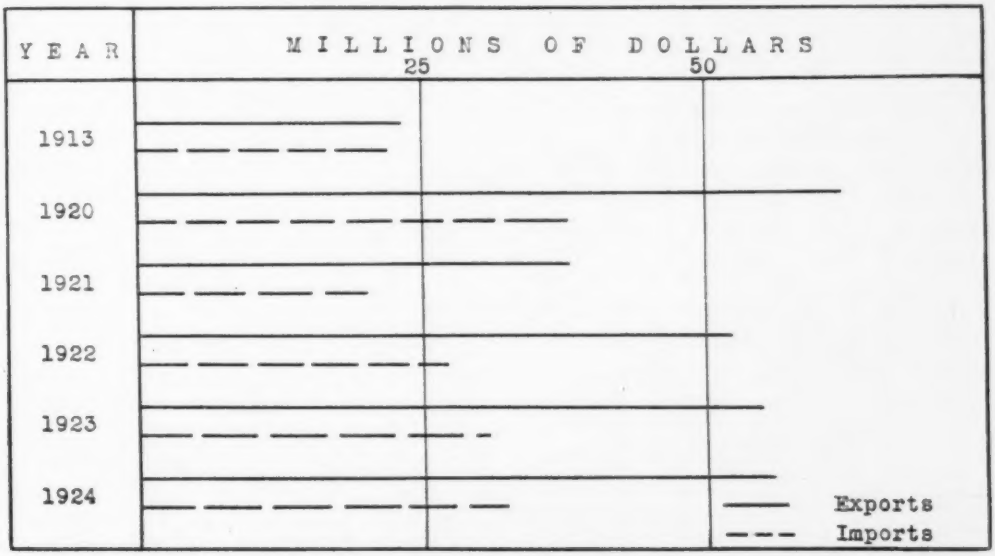


FIGURE 33.—Total exports and imports of Alaska during the last five years and the pre-war year, 1913. This chart shows in another way the great wealth of the territory. The abundance exhibited on the export side is neither advantageous to the territory as a whole nor to its permanent population, for most of the industries have been developed by outside interests. (Data: Commerce Yearbook, 1924, page 564.)

In estimating population possibilities in new lands, geographers commonly make comparisons with developed regions of like or similar environment. The method has limitations for Alaska, however, since the European peninsula corresponding to the territory (Norway, Sweden and Finland) has but superficial resemblances. The population density of this country, therefore, will merely serve in making a broad generalization.

The total area of the Fenno-Scandian Peninsula is only three-fourths that of Alaska, but its population is two hundred times as great. For every one person living on eleven square miles of Alaska, this peninsula has an average of twenty-eight living on one square mile. Yet the actual amount of forest and agricultural land is, in a general way, equal to Alaska's. In so far as regions in similar latitudes and continental positions have "equivalent" economic possibilities, Alaska seems capable of sustaining at least twenty-five people to the square mile.

Export of Raw Materials

Most of the territory's trading is conducted with the United States, the trade balance favoring the export traffic (Fig. 33). While the value of this class of goods is approximately twice the imports, the character is not very favorable. The exports are largely salmon and copper (Fig. 34)—the first won from the sea and the second from the mine. The leading imports, on the other hand, are iron and steel (almost one-half of which is "tin" for the canning industry), machinery, mineral oil, meats and butter.

This type of trade is normal for a new country, but neither particularly advan-

tageous to, nor necessary for, Alaskan development. Her agricultural resources are such that she is capable of supplying herself with many of the food materials now imported from outside markets and her Pacific Industrial Region offers manufactured goods of permanent basic value to the export trade. The total agricultural area, including the lowlands of the Pacific Mountain System, is equal to one and one-half times that of Finland.

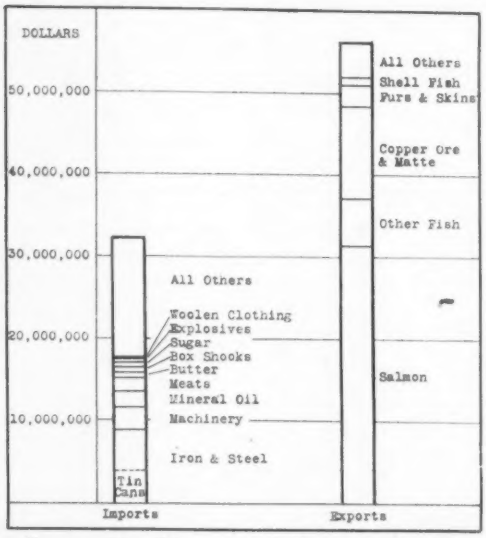


FIGURE 34.—The trade of Alaska during 1924. This commerce makes it appear that Alaska has but three resources—fish, copper, and furs—and that it is essentially dependent upon outside sources for most of its needs. Even lumber and other forest products appear upon the detailed import list. (Data: Commerce Yearbook, 1924, page 564.)

While the agricultural resources of the two countries are not accurately comparable, the Alaskan region, nevertheless, like the Finnish area, should be reasonably self-sufficient for the territory. Alaska, moreover, has not only coal, water power and petroleum, but also iron, copper and other metals whose fabrication will some day lead to expansion in the Pacific Industrial Region; and it is interesting to note that market gardening areas so essential to such regions exist in the wet Pacific Mountain valleys which are preëminently well adapted to this agriculture.[21] Potentially also, in so far as natural environment "determines" these assets, she has all the "brains" and quality of the Norwegians to develop her resources, although it is highly improbable that Alaska will ever become a carrier nation and produce the skilful sea-faring folk of Norway.

Transportation

Trade calls for internal as well as external transportation facilities. Both means are insufficient to care for the future development of the territory, although they are probably adequate for present economic growth. Internal movement is largely effected over rough roads, trails and a small mileage of improved highways. Railroad transportation is supplied by five hundred miles of costly, but important, government-built lines running from Seward on the Pacific Coast to the interior, and by several short branches serving the Industrial Region and the Seward Peninsula. In summer, about five thousand miles on the Yukon and its tributaries are open to navigation. Most of the territorial movement is, consequently, accomplished over somewhat primitive highways, owing to the pioneer conditions prevailing in the region. Evolution in this element of economic expansion, however, is contingent simply upon industrial growth.

In international trade routes, watercraft leaving San Francisco for Japan rarely touch Alaska. The territory is ordinarily and conveniently reached by boat from Seattle, the trip through the famous Inside Passage including one of the most scenic in the world. This section of Alaska is the best known part of the territory; its forested islands, innumerable streams and picturesque shores offer ideal recreational opportunities to the population of the growing Pacific Industrial Region of the United States.

[21] Information for Prospective Settlers in Alaska, U. S. Dept. of Agriculture, Circular No. 1, p. 13.

THE LAURENTIAN PLATEAU IN CANADIAN ECONOMIC DEVELOPMENT

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CANADA lies within two spheres of influence; she derives her origin from Great Britain, and the United States is her neighbor. Canadians have been told repeatedly of recent years that they act as the interpreter of one to the other. Similarity of economic and geographic conditions turn us to the United States; the ties of race and tradition hold us closely to Great Britain. As a small and proud people, Canadians have as a rule been prone to exaggerate their differences with the United States just as the Scots have always drawn exaggerated distinctions between themselves and the English. A certain dissimilarity of outlook and tradition there assuredly is, but its extent has been pardonably overemphasized. On the other hand, the assumption of the geographic and economic similarity of Canada and the United States has usually been accepted much too uncritically. There are, it is true, great major facts which have powerfully affected the histories of both countries. The most significant among these have been the presence of free land and the consequent problems of internal expansion. As soon as we consider, however, the course of the internal expansion, similarity between the two countries to a considerable extent fades and we discover that in Canada the development of inland empire, dominated though it was by similar motives, involved very different problems which called for new and distinctive solutions. There is, at present, need for less emphasis on distinctions of race and tradition between ourselves and the people of the United States, and somewhat more emphasis on the different geographic and economic factors which have dominated each distinctive development.

The Central Lowland of North America

In striking contrast to Europe with its easy access to the sea, North America is essentially a continent in which the economic prizes lie in the interior. Mountain barriers parallel the coasts. On the West, the Rockies stretch from Alaska to Panama in an unbroken line; in the East the Appalachian-Allegheny barrier runs from Quebec to Alabama and constituted for long in American history an effective obstacle to the movements of trade and population. Between the Appalachians and the Rockies rolls the practically unbroken central plain where, to the movements of men or of goods, there are no barriers other than those presented by great land distances. To the northwest the central plain stretches itself as far as the Arctic, and to the northeast, it reaches the Atlantic through the narrow St. Lawrence Valley. It was this great expanse of territory which lay open to the people of the United States when, in the middle of the eighteenth century, they first began to blaze the trails which led beyond the Appalachians to the Tennessee, the Ohio, and the other tributaries of the Mississippi. From that time America found her opportunity in the Mississippi Valley.

In some regions, man-power is cheap and natural resources are economized. In the Mississippi Valley man-power was economized and natural resources exploited lavishly. Professor Frederick J. Turner and others who have followed his distinguished lead have made abundantly clear the overwhelming importance in the history of the United States of the movement of the frontier across the Mississippi Valley. If the frontier has placed its stamp on American life and history it is

because the frontier continued for so long to be a factor, and because it represented so large a proportion of the United States. Nowhere else in the world has the frontier moved so quickly and yet persisted so long in the life of a people. This persistence and extent were due to the possibilities afforded by the great level expanses of the Mississippi Valley. For a century and a half population poured into this great inland empire with unprecedented rapidity. Ease of settlement, the absence of barriers to migration, the richness of the soil, brought about a hitherto unheard of exploitation of natural wealth. The nation-building forces thus brought into action were the forces which produced the United States of the present day. Only the presence of the Central Lowland can explain the way in which the people of the United States turned their backs on the Atlantic and devoted themselves to the exploitation of the interior. What America was to Europe the Mississippi Valley was to the rest of America. Between the Appalachians and the Rockies lay the valley of economic opportunity.

THE CENTRAL PLAINS IN CANADA

Canada has had a counterpart to the Mississippi Valley only in the Western provinces where the regions drained by the Nelson-Saskatchewan and the Mackenzie-Peace have offered a similar facility for rapid settlement, although the larger part of these drainage basins is too far north to permit of extensive settlement at the present time. To the east, what is essentially a part of the Central Plains constitutes the St. Lawrence Lowlands, including Western Ontario and the narrow St. Lawrence Valley lying between the Laurentians on the north and the Appalachians extending to the Notre Dame Mountains of Quebec on the south. Between this eastern branch and western branch of the Central Plains there exists a geological area of more than two million square miles and covering more than half the entire surface of Canada, variously known as the Laurentian Plateau, the Canadian Shield or the Pre-Cambrian Area.

THE LAURENTIAN PLATEAU

Hudson's Bay lies in the center of a great shield-shaped formation. The southern point of the shield juts into New York State just below the mouth of Lake Ontario, creating in the St. Lawrence River the famous Thousand Islands To the east the rim of the shield runs back from the St. Lawrence to the City of Ottawa and, following the course of the St. Lawrence at a distance varying from a hundred to a very few miles, finally reaches the coast of Labrador. West of the point, the boundary runs from the eastern end of Lake Ontario to the southern shore of Georgian Bay, then follows the north shore of the Lakes until west of Lake Superior it juts down into Wisconsin before it turns north. Skirting the Red River Valley and the eastern shore of Lake Winnipeg it follows a northwesterly direction till it reaches the shore of the Arctic Ocean. A glance at the geological map will show the general outlines of this region, by far the greatest single geological area in Canada—one which completely separates west from east.

GEOLOGY

The Laurentian Plateau with its distinctive Archean or Pre-Cambrian geological formations is, according to the geologists, the visible and well-preserved remains of the ancient continent of Laurentia, and constitutes the oldest part of the present continent. The most familiar rock structures are the Laurentian granites and gneisses which were extruded through the still older Keewatin and Grenville formations to form the great dome-like granite hills or "batholiths" so typical of this region. In some parts these older structures have been overlaid with sedimentary Huronian rocks visible in the marbles and crystalline limestones. All the formations antedate, however, the Cambrian and other Paleozoic eras and are distinguished as Archean or Pre-Cambrian.

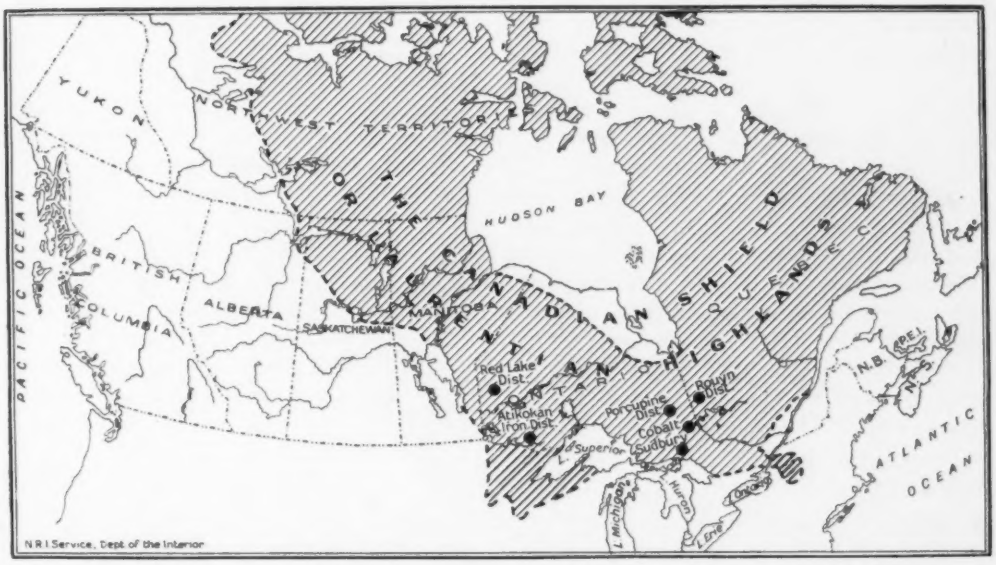

FIGURE 1—The Laurentian Highlands, or Canadian Shield, comprise most of Canada east of the Prairie Provinces and the Mackenzie Basin. (Courtesy of Dept. of the Interior, Canada.)

The original forms of rocks in the Pre-Cambrian area are largely obscure as the formations are characterized by intensive deformation and metamorphism. Evidently mountain-building processes were at work, but the mountains were worn down to the present familiar low hills by prolonged periods of erosion. The Huronian structures indicate that the Laurentian continent gradually sank and sedimentary deposits were formed along its shores.

It is calculated that the Pre-Cambrian geological era was probably as long in duration as all succeeding eras, but the age-old Laurentian formations present today many of the characteristics of new geological structures. This is the result of the Ice Age through which the continent passed after the conclusion of the Tertiary geological stage. In this period, the great glaciers of Keewatin and Labrador advanced and receded. The loose soil and decomposed rock which ages of weathering had accumulated were carried off to form glacial deposits farther South. The Laurentian hills and rocks were worn down and rounded off. Valleys were gouged out, drainage systems were completely rearranged, and lakes were formed from the blocking of rivers and from the scooping out of valleys. The withdrawal of the ice left great moraines, accumulations of gravel and boulders, and huge glacial lakes, remnants of which still exist.

PHYSICAL FEATURES

Though the Canadian Shield is frequently referred to as the Laurentian Plateau, it possesses few of the characteristics of the plateau. A considerable part of it is less than a thousand feet in altitude; the highest elevations are found in the eastern part of the area where on the coast of Labrador altitudes of seven thousand feet are reached. On the west the elevation declines until in parts of Manitoba the Laurentian country is actually below the level of the first prairie steppe. The whole area is saucer- or shield-shaped with the southern boundary as the rim and Hudson's Bay as the central depression. The watershed north of the St. Lawrence Valley lies comparatively near the shore line; northward the slope is toward Hudson's Bay. The drop on either side of this watershed provides copious water power. Nothing is more characteristic of this region with

its sparse forests, and its barren granite rocks, than the great abundance of lakes and rivers of all sizes. The broken, uneven, and wooded character of the country furnishes ideal conditions for water storage over the entire area.

As would be expected from the nature of the territory, agricultural soils are lacking except in a few of the valleys where glaciers have left considerable deposits or occasional gravelly ridges which are evidently glacial remains. On the southwest coast of Hudson's Bay a strip of territory which is not really Laurentian in character provides a clay belt which may at some time become of agricultural importance.

FIGURE 2—A typical Laurentian landscape, near St. Agathe, Quebec. Island-studded lakes, rounded hills, rocky and forested, and primitive agriculture, characterize the Shield. (Courtesy of The Canadian Pacific Railway.)

THE LAURENTIAN PLATEAU AND SETTLEMENT

It has been pointed out that the Mississippi Valley lay like an open road before the pioneers of the United States. The Laurentian Plateau constituted an entirely different factor in the case of Canada. Geographically the St. Lawrence Valley provides access from the Atlantic to the Mississippi Valley. Canada, however, lies north of the Mississippi Valley and the St. Lawrence of itself only offers limited access to Canadian territory. The largest settlements in Canada up to the beginning of the twentieth century were to be found in the St. Lawrence Lowlands, a region falling into two sections, as already pointed out, and separated about Kingston by the point of the Laurentian Shield which there projects into New York State. East of Kingston the St. Lawrence Lowlands are narrow and restricted in area. To the west the relatively high, level territory of Western Ontario with its deep and fertile soil, has provided the basis for the densest population which we as yet have in Canada, and it is essentially a spur of the Central Lowland of the United States. When settlement had, however, covered the St. Lawrence Lowlands, and expanded as far west as Lake

Huron two barriers were encountered; on the south and west the International Boundary, and on the north the Laurentian Plateau. During the period of the 50's and 60's when the United States was making rapid strides in the settlement of Wisconsin and the Trans-Mississippi States, Canada was experiencing a much needed prosperity, and yet was extending her permanent settlement but feebly into the borders of the Laurentian Plateau. Colonization, helped on by the high prices of lumber and grain, and government built colonization roads, extended into the Laurentian country north of Lake Ontario and into similar territory in Bruce County between Georgian Bay and Lake Huron.

Settlement accompanied the extension of the lumber industry which moved into the Laurentian area of Old Ontario, but it depended for its existence wholly on the continuance of prosperity in the timber trade, and when that trade collapsed with the decline of business following 1873 and the increased competition of Michigan timber, the settlers found themselves stranded and marketless. The rich but unsubstantial soils of the Laurentian valleys yielded in the early days enormous crops of oats and potatoes, sold at remunerative prices to the lumber camps for winter supplies. Such agriculture, however, was doomed because the clearing of the land not only removed the market when the lumber industry moved on to virgin forests, but frequently the soil was so light that comparatively few seasons' rains washed the most of it away.

Density of Population

A glance at a map showing density of population in Ontario and Quebec would reveal how closely the settlement has followed the southern boundary of the Laurentian Plateau. Densities of from 50 to 75 people to the square mile quickly fade at the Laurentian boundaries and rapidly decline to densities of less than one to the square mile. In Old Ontario, at least, the Laurentian borderlands, where agriculture has been tried and has not been supported by mining communities, are areas of declining population. An inverse natural selection has set in, leaving frequently the most shiftless and incompetent elements of the population behind, and growing isolation has brought social conditions which make the territory a notorious rural slum. For a period of seventy-five years the attempt of agriculture to move into the Laurentian country of Ontario has failed wretchedly, with lamentable social costs.

Westward Expansion

The important frontier, however, for Canadians in the period after the Civil War, when all of Southern Ontario was taken up, until the beginning of the twentieth century, when the prairies became accessible, was in the United States. The Laurentian Plateau was an effective barrier to westward expansion within Canada; it deflected thousands of Canadians across the International Boundary into the American West, until at the end of the century a third of our population lived in the United States. These were the days of depopulation when the Scriptures, according to a Canadian Finance Minister, were said to "begin with Exodus and end with Lamentations." The center of the United States was occupied by a valley rich in agricultural resources providing the basis for home-building industries; the center of Canada was occupied by an area rugged and forbidding and providing little at that time but lumber, for which the market was strictly limited by competition and the cost of transport.

Historical Significance

The barrier to settlement which the Laurentian Plateau set up has affected the history of Canada in two related but distinct ways. Two regions have been of great importance in the history of the United States for which Canada had during much of its history no counterpart.

Throughout the nineteenth century the South and the West were great dynamic forces in the development of the American Republic. The South with its tobacco and its cotton primed the circulation of American commerce, and after 1800 when it took the place of the West Indies as the pivot of American trade, it obtained a dominant economic position. It was Southern cotton which linked the United States with Europe, which provided a home market to a considerable extent for Northern farm products, which created also sale for New England manufactures, and which permitted the United States to import European goods at the time when she was still unable to supply her own needs in manufactured commodities. Without the South with its desirable staple, the development of the United States, in the years before the railway and before steam navigation, must have been greatly retarded.

The West in its initial stages developed as an adjunct of the South. The presence of the Southern market made possible the production of the heavy, bulky staples which came from the upper Mississippi Valley and, even though these staples were not produced and not marketed without great difficulty in the matter of transportation, it was the presence of the Southern market which permitted the expansion into the American West prior to the Civil War. After the Civil War the cheapened transportation of the railway and the steamboat, the exploitation of the virgin soils of the prairie regions permitted the West to export its own staples to the European market and reorganized to some extent the structure of United States trade.

In Canada this arrangement had little counterpart; for half a century Canada struggled vainly with grain and lumber as her chief export staples. Even with the help of substantial British preferences, granted under the Corn Laws, the Canadian grain trade never quite established itself, while Canadian timber only entered the British market with difficulty and spasmodically in competition with Baltic timber. Canada was starved economically during the first half of the nineteenth century because she lacked the great export staple which could be economically transported to the world market. In place of the South we had the Laurentian Plateau and thanks to that same geological area the virgin soils of the Canadian prairies were fifteen hundred miles distant from the border settlements of Ontario. For the first half of the nineteenth century we suffered because instead of cotton fields we had the sparse soil and granite rocks of the Laurentian area as a counterpart to the deep black-soiled river bottoms from which Southern cotton was produced.

In the second half of the nineteenth century competition was quite as unequal. In the United States the settlers conquering the wooded areas in the eastern part of the Mississippi Valley emerged, about the middle of the century, on the prairies, and settlement and expansion proceeded continuously. In Canada, on the other hand, the settler and pioneer hewing his way laboriously through the hardwood forests of Western Ontario met the International Boundary on the west, and found on the north the hardwood forest disappearing in the softer woods and in the coniferous northern forest, valuable enough in itself, but the product of rude and scanty soil and a bad omen for future agriculture. From Georgian Bay to the Red River Valley, a distance of fifteen hundred miles, the great Laurentian barrier, less formidable because of its height than because of its width, kept our settlements from the open prairies. Not until the turn of the century did the economic possibilities of the Canadian prairies bring their reaction on the industrial life of Eastern Canada. In the first period of westward expansion in the United States, Canada was handicapped by her bulky staples and her distant market. In the second period, she was handicapped because the Pre-Cambrian region lay between her and the prairie soils with which eastern wooded areas could not compete.

THE LAURENTIAN PLATEAU AND TRANSPORTATION

As has already been made apparent, settlement in North America depends largely on land transportation. Great as are our inland waterways and important as has been the two thousand miles of the St. Lawrence system to Canada, settlement has always been seriously limited until the railway brought greater mobility to both population and the products of industry. The development of the Far West in the case of both countries has been linked to development of railways. The United States entered the Mississippi Valley in the period of the turn-pike road and the canal, but her conquest of its broad expanses was made with the railway as the chief weapon. Nowhere in the world perhaps is there an area seemingly so specifically created by Providence for the railway-builder as the Mississippi Valley. A possible parallel on a much smaller scale is to be found in the North German plain where the Prussian State Railways have also had the happy combination of low construction costs and low operation ratios. With its level topography and great economic resources, the Mississippi Valley has made it possible to build and operate railways cheaply and has provided the traffic density on which successful railway operation largely rests.

FIGURE 3—Omatchouan Falls, Northern Quebec, is illustrative of the many cataracts and cascades that beautify the streams, and constitute the great reserve of power that the region possesses. (Courtesy of the Canadian National Railways.)

Transcontinental Railways

It is characteristic that American transcontinental railways, so called, begin at Chicago to push their way through the fertile States lying West of the Illinois and the Mississippi, cross the desert and mountains, and emerge on the Pacific Coast. In Canada, however, the transcontinental railways really start with the ocean port of Montreal; by the time they reach the meridian of Chicago they are a thousand miles on their way. Only a few miles from Montreal the railways enter the Laurentian country and from there to the valley of the Red River they traverse a territory where engineering difficulties are great, construction costs high, and local traffic, for the most part, negligible. In the early development of transportation, it would have been much better for Canada had the Laurentian country been completely covered by water, for water unites but land divides, and for many decades the remnant of the old continent of Laurentia divided one half of Canada most effectively from the other half.

It follows that the building of transcontinental railways in Canada was a much greater venture and more fraught with risk than in the case of the United States. It was not only that the United States was a country already of large population whereas we had but a scant three and a half million to support the enterprise; it was not only that our prairie region was entirely unpopulated when the Canadian Pacific Railway was proposed, and that economic development in British Columbia had not yet

begun, but between southern Ontario and the prairies, the two points where potential traffic was available, there stretched the Pre-Cambrian Shield with no traffic prospects but with heavy railway costs.

The engineering tasks of building a transcontinental railway in those days were great and might well have daunted the men like Sanford Fleming, who made the first surveys of the road, but the financial problems were even more threatening and only a courage and an optimism amounting almost to foolhardiness, and the addition of a government subsidy had enabled the men who planned the Canadian Pacific to build the road through Northern Ontario rather than follow the geographically natural route south of the Lakes.

It is interesting for Canadians to speculate as to the possible results in the development of our country which might have come had the boundaries as defined by the Quebec Act, namely, the Ohio River as far as the Mississippi, been maintained. The central fact of railway geography of this continent is that the St. Lawrence Valley pivots on the Mississippi at Chicago and the best railway route, from purely economic considerations, from Ontario to the Canadian West lies through Chicago and not North of Lake Superior. It was the appeal to nationalism rather than to commercial interest which led the Government to bonus the Canadian Pacific on condition that the road be constructed through Canadian territory, and undoubtedly the political and economic results of the policy have been great beyond the possibility of calculation.

Extension of Canadian Railways

Great and daring as has been the national strategy of our railway policy, it has left us with many problems unsolved and many costs to pay. Not content with the construction of the Canadian Pacific, we undertook from the beginning of the century to construct two new transcontinental roads. The Canadian Northern which grew from a little local railway in Manitoba with a crew of literally "two men and a boy" expanded east and west, financed with Government guarantees on a shoestring, until it had by 1914 almost reached completion as a transcontinental. About the same time the Grand Trunk with dreams of Western empire in the mind of its energetic manager, Charles M. Hays, and to some extent in retaliation for the invasion of its traffic territory in the East by the Canadian Pacific, joined the Government in the tremendous and unfortunate project of the National Transcontinental and the Grand Trunk Pacific. With Government aid the Grand Trunk undertook to build the Grand Trunk Pacific and to lease the line of the National Transcontinental which the Government was to construct from Moncton, New Brunswick, to Winnipeg. By 1914 this project had also reached completion and our third transcontinental railway was awaiting the traffic which has not yet come.

Thanks to the presence of the Pre-Cambrian region our railway systems are divided into two nets, the eastern covering the St. Lawrence Lowlands of Ontario and Quebec and the Maritime Provinces, and the Western covering the prairie provinces with extensions to the Pacific Coast. Between these two nets stretch the long distances of Northern Ontario through which the Canadian Pacific and the original Canadian Northern lines pass and the still longer stretches of Northern Quebec across which the National Transcontinental was constructed in an attempt to open out a new traffic territory and tap the clay belt which lies North of the watershed in the Laurentian area.

Railway Problems

The dominant fact in our railway problems is that between the valley of the Red River and Georgian Bay or the City of Quebec on the more northerly route, lies the great traffic desert from which

our railways derive enormous operating and fixed expenses and next to nothing in local revenue. Had we but continuous traffic territory from the wheat fields of the West to the agricultural areas and manufacturing districts of the St. Lawrence Valley, our tremendous railway expenditures would be wholly justified and Canadians would be less troubled than they are over the financial condition of our railways. Not only, however, is the expense of hauling the comparatively light, and to a large extent one-way, traffic from west to east through the northern parts of Ontario and Quebec very high, but the presence of the Great Lakes seems to complicate rather than simplify the matter.

Owing to the fact that from Port Arthur and Fort William at the head of Lake Superior down to the sea, railways are handicapped by water competition, railway rates throughout that area are limited for bulky goods by the water rates which are available throughout the season of navigation. This has meant that in the past railways have recovered their losses on this deficit-producing territory from the imposition of higher local rates in Western Canada. In the east the presence of water competition set the limit of the tariff and created a differential in favor of the east. Throughout the last decade the differentials between west and east have been substantially reduced, but the problem of distributing the losses resulting from this area, barren of traffic, between the two traffic-producing regions on either side of it, continues to be pressing. Canadian Governments, Dominion, Provincial and Municipal, have invested more than a billion and a half dollars in railways. It is easy to see that for the present our railways are overbuilt, but if the Laurentian Shield was to be crossed, aid to something like this extent had to be given.

THE LAURENTIAN PLATEAU AND INDUSTRY

Much in the future of this country depends on what the Pre-Cambrian area under discussion will produce in the way of natural resources for industry.

Minerals

At present our knowledge of the natural resources of this great area of two million square miles is exceedingly limited. We know what it has produced in a spectacular way in a few districts—the great iron deposits of Minnesota which are on the edge of the Pre-Cambrian area supply almost the entire iron and steel industry of North America; in Michigan the deposits of native copper; the Sudbury nickel-copper deposits; the spectacular development of the Cobalt silver area and of the Porcupine gold region, have given rise to predictions that the whole of the Pre-Cambrian region is to duplicate these great mineral resources again and again. Already the rush to the Rouyn gold fields and to the newly discovered Red Lake District, have been hailed as mere samples of what may be expected to come.

It does not, of course, necessarily follow that because the nickel, gold and silver of Sudbury, Porcupine, and Cobalt are found within a small area, that the entire region of the Pre-Cambrian should be proportionately productive. Yet, on the other hand, it is perfectly clear that only a small part of the whole area has been thoroughly prospected and it is to be expected on the basis of the law of averages that future explorations will result in a fair number of successes. It is well known that there are on the Canadian side of Lake Superior large deposits of iron which are of lower grade and less easily mined than the deposits of the Minnesota ranges, but nevertheless there is every expectation that in the future as the Minnesota deposits become exhausted or decline in grade that Canadian deposits will become commercially usable. Our nickel and copper deposits constitute virtually a world monopoly, producing over 80 per cent of the world's nickel, but it would

be foolhardy to prophesy that any further nickel district would be discovered, as the Sudbury district has now been in operation for a long time, and much prospecting has failed to bring further discoveries to light. Undoubtedly the gold and silver areas will be extended and others will be discovered in many parts of the Pre-Cambrian area in Quebec, Manitoba and elsewhere. Further south on the point of the Shield, in Southern Ontario, there are valuable deposits of lesser import, where such minerals as feldspar, mica, talc, corundum and various types of building and ornamental stone occur in great abundance and furnish the basis for a development of mineral and mineral-using industries.

FIGURE 4—The mineral resources of the Laurentian Highlands are rich and varied. Only a very small part are probably as yet discovered, because of the difficulty of travel and exploration. The Sudbury Copper-Nickel area, in which this Creighton Mine of the International Nickel Company is situated is one of the richest discoveries. (Courtesy of the Natural Resources Intelligence Service, Department of Interior, Ottawa, Canada.)

The great mineral lack of the Laurentian Plateau is coal. The mineral areas of North America seem to extend in bands following roughly the shape of the Pre-Cambrian area. In only two sections of Canada are there coal-bearing geological structures. In the far East and the far West, in Nova Scotia, and in Alberta and British Columbia there are large and important deposits. Unfortunately when comparing these deposits with those of other countries such, for example, as those of China, Canadians are apt to forget that a considerable part of our supply of coal is lignite and not high-grade bituminous. Canada will probably always have to cope with the coal problem in so far as the presence of water power does not offset the deficiency. There is no use in shutting our eyes to the fact that the central part of our country, thanks to the Laurentian Plateau, is coal-less and must obtain considerable quantities of coal from the Pennsylvania mines even though water power be developed beyond our rosiest dreams.

Water Power

Though water power may not do all for Central Canada, that some of its least sober enthusiasts would have us believe, yet the "perpetual annuity" of our water powers, if wisely conserved will do much to mitigate the burdens which geography has laid upon us.

The Laurentian country has been especially blessed with available water power. Canada has already developed three and a quarter million horsepower from her waterfalls, an amount only exceeded by the United States. Her development of three hundred and fifty-five horsepower per capita is greater than that of other countries with the exception of Norway and Switzerland. In addition to the water power already utilized, however, Canada has, it is estimated, available at the minimum flow

FIGURE 5—Power development and pulp mill at Smooth Rock Falls, Northern Ontario. (Courtesy of the Canadian National Railways.)

eighteen and a quarter million horsepower, and at a maximum development thirty-two millions. Of these amounts seventy-five per cent represents available water power in the provinces of Quebec, Ontario and Manitoba and lies mostly within the Laurentian region.

As pointed out before, this region with its northern forest, ample precipitation and innumerable lakes constitutes an ideal environment for water storage. Though the elevation is comparatively low, the fall in all four directions is pronounced. All the conditions necessary for abundant water power are present. The most important power developments, with the exception of Niagara, which lies outside the region under discussion, have taken place on the rivers flowing from the Laurentian Plateau to the St. Lawrence Valley. Of these the most important have been the Ottawa, the St. Maurice and the Saguenay which lie in whole or in part in Quebec. In Quebec the elevation of the Laurentians is greater and the drop to the St. Lawrence Valley more abrupt than in Ontario. The James Bay Drainage Basin also has great available power resources. In Northwestern Ontario and Manitoba the fall from the Plateau to the first prairie level provides valuable waterpower on the Winnipeg and other rivers. Further North the Labrador and Hudson Bay basins have enormous power resources but there seems little likelihood of their being commercially valuable.

The fact must not be lost sight of that the power resources of the Pre-Cambrian area can only have value as industrial uses are found for them. To city dwellers, that electrical power has value, seems an elementary axiom. Power in the wilderness, however, has æsthetic but not commercial value until some industry requires its aid. The mining industry of the North country has availed itself of power resources to some extent

but the need is comparatively small. At present the pulp and paper industry has sprung from the fertile marriage of Laurentian spruce and Laurentian power.

Forests

Canada has of recent years forged ahead as a producer of paper. In the production of newsprint she has this year passed the output of the United States and when improvements and extensions now under way are completed she will almost have doubled her output. Of the pulp which is produced in Canada about ninety per cent comes from the two provinces of Ontario and Quebec and from the Pre-Cambrian region. In the Northern forest, spruce, jackpine, poplar, and balsam predominate, and on these the pulp industry is based. The saw-timber of Canada is dominated more and more by the British Columbia forests but in pulp wood the Laurentian Plateau is unrivalled.

The present century has brought this region an industrial development in the mines and forests undreamt of in earlier years. It may be that a moderate agricultural development will be attained in some of the valleys and in the northern clay belt. There is great need that the industrial opportunities of this region be utilized to the full that Canada may have industrial breadth as well as length.

CONCLUSION

It is doubtful if in the past any other single factor has had quite so much significance in the development of the Canadian people as has the presence of the Laurentian Plateau as the major geographical fact of our existence. The first settlement in Canada was established in 1608, twelve years before the

FIGURE 6—After the lumberman, the tourist, as this summer hotel at Point au Baril, Quebec, overlooking the log boom in the foreground, shows. (Courtesy of Canadian Pacific Railway.)

FIGURE 7—The Hollinger Mine at Immins, Ontario, one of the most famous of the Laurentian Shield. Other rich gold fields may confidently be expected in this general region, when exploration and prospecting shall have been more thoroughly done. (Courtesy of the Canadian National Railways.)

English colonies to the south were founded. The development of Canada has obviously lagged behind that of what has now become the United States, and the chief reason for this retarded growth is to be found in the stubborn conditions which the Pre-Cambrian region has imposed upon us. An effective barrier to westward expansion, this region prevented our country from developing for many decades sufficient diversity of natural resources to create internal trade of any significant volume. Since the days when, in spite of this barrier, the Canadian West was open for settlement the area has exacted heavy toll in transportation costs, and these transportation costs Canadians are likely to continue to pay for many years to come.

It is difficult and certainly not safe to predict what the future influence of the Laurentian country is to be; everything depends upon the natural resources which become available there for industrial development. If those resources which have already been found and are now undergoing exploitation can be considered as merely a sample of what is to be found throughout the entire region, then indeed the Laurentian area is destined to produce wealth untold. If, on the other hand, we have already opened out the best of the resources of the region, progress in the future is likely to be slow and laborious. There is every reason for proceeding with the greatest care and economy to ensure to the Canadian people that the resources which the Pre-Cambrian area undoubtedly will yield, even though in limited quantities, are not squandered, but are maintained as "trust in perpetuity" for future generations of Canadians.

Just what the future holds in store through the still greater development of our mineral industries, of our forest industries, and of our water power, is a matter for the engineer and the financier to determine. To the economist and historian, however, it would seem clear that the Canadian Shield would continue to be the most significant geographical factor in the development of the Canadian people, and that, in so far as we derive national characteristics from geographic and economic factors, the resistance and the opportunities which that area offers to our industrial development are likely to mold to a considerable degree the distinctive characteristics of future Canadians.

THE EVOLUTION OF BRAZILIAN COMMERCE

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THE commerce of Brazil, once in the lead for South American countries, now holds second place, constituting about one-fifth of the trade of the continent. It equals only one-third that of Argentina, the premier commercial republic of the southern hemisphere. Yet Brazil has some of the largest latent agricultural and mineral resources to be found in the world. Its colossal sweep of lands extending through a variety of tropical and temperate climates embraces 45 per cent of the area of South America, an expanse of territory three times that of Argentina, and larger than that of the United States of America. Its population numbers 31,000,000 people, almost four times as many as Argentina. However, despite this great area, the per capita foreign trade of Brazil amounted to only twenty-eight dollars in 1925, while that of Argentina was two hundred dollars.

Nearly three-fourths of the Republic has tropical climates and almost one-half supports a tropical vegetation, which on the whole has not yielded readily to the axe and the advance of the agriculturist. At present only one-fifth of the territory of Brazil is in farms, while only 3½ per cent is under cultivation. More than half the population lives in a continuously hot climate, the majority of whom are Indians, negroes, and mestizos, who have a high degree of illiteracy. Their small productive capacity and low purchasing power seriously retard the commercial development of the country.

Transportation facilities are inadequate; good transportation, the key to economic progress and commercial expansion, is lacking in fully seven-eighths of the republic. In the other eighth, where railway lines do exist, the freight rates are high and only a few of the lines pay a profit so that it is difficult to finance new and better railways. Furthermore, if millions of dollars were available, lines could not be built in some districts, owing to concessions granted to existing lines. For example, an English concern by ownership of the São Paulo Railway has a complete monopoly in the transportation of coffee, the leading export commodity of Brazil, from São Paulo to the sea at Santos.

The high export duties levied by the individual states and the excessive tariff on imports imposed by the federal government choke the growing industries of the several states and hamper the commercial expansion of the republic. Furthermore, such unsound economic policies cause foreign interests seeking places for the investment of capital to turn to other parts of the world where shortsighted statesmen will not tax new industries out of existence. Free-flowing currents of trade do not exist in the United States of Brazil. Consequently, many of the superb advantages conferred upon Brazil by nature have been recklessly and forever thrown away by her politicians, resulting in a striking rise and then collapse in many of the once great Brazilian enterprises.

The Growth of Brazilian Trade

Colonial Brazil was for a time the greatest source of cane sugar in the world, and Portugal thrived upon the sale of this commodity to her less fortunate European neighbors, but the development of plantations in the West Indies and other tropical regions, and the rush to the Brazilian gold fields led to a decline in Brazil's position in sugar production. Then with the first great gold-rush of modern times, came the Golden

Age of Brazil. An annual production of $200,000,000 was maintained for some years. After the first wave of the excitement of the gold-rush, came the electrifying news of the discovery of diamonds in Minas Geraes, and adventurers swarmed into the region from all parts of the world. Cities sprang up in the wilderness; dazzling palaces were built and thronged, and an enormous revenue streamed to the coast. For a short time Brazil supplied the world with gold and diamonds; then the depletion of the richer deposits left scores of towns stranded on the ebb of prosperity, only to decay with the passing of years. The improvements in the industrial use of the gum of the *hevea brasiliensis* opened the way for the invasion of the silent forests of Amazonia by an army of rubber gatherers, who developed Brazil's next wonderful and unexpected source of wealth. With the heavy export duties in Brazil and the increased production of plantation rubber in the Middle East, this great industry went the way of previous ones. Today is the age of Brazilian coffee; but is not the handwriting already on the wall if the present manipulation of prices continues?

However, it has always been the peculiar good fortune of Brazil that at the moment when one industry suffered a sharp decline, the glow of another appeared upon the skyline heralding new triumphs; the vast and varied territory, the range of climates, the different products offered by tropical forests, high plateaus, mineralized mountains, hot sandy coasts, and grassy plains render Brazil, as a whole, safe from the fatal reverses that threaten a land dependent on one or two commodities for its commercial life.

While the commerce of Brazil has shown a remarkable rise and fall in various commodities, the total trade steadily increased from 13 million dollars in 1800 to about 51 million dollars in 1850. Then with the development of the rubber and coffee industries on a larger scale came a growth which carried the total trade to 675 million dollars in 1912, the high-water mark in Brazilian trade, previous to the World War (Fig. 1).[1] The sharp drop in Brazilian commerce following 1912 resulted largely from the crisis in the rubber industry. During the World War, Brazil's foreign commerce increased and continued favorable until the early part of 1920. Owing to over-expansion in some industries, the depreciation of exchange, the loss of foreign markets, and the decline in demand for some of its products, Brazil shared in the general world commercial depression which began at that time. The trade of recent years shows that the country has recovered almost completely from that crisis.

THE EXPORT TRADE

The export trade of Brazil, like that of Argentina, consists largely of food stuffs and raw industrial materials for the millions of people and the manufacturing industries of the United States and northwestern Europe. The export commodities come almost entirely from agricultural production, in spite of the fact that

[1] The statistical information for this article was compiled from the following sources:

1. Resumo de Varias Estatisticas Economico—Financeiras. Directoria General de Estatistica, Ministerio de Agricultura, Industria e Commercio. Rio de Janeiro.
2. International Yearbook of Agricultural Statistics 1924–25. International Institute of Agriculture, Rome.
3. Yearbooks of the Department of Agriculture, Washington.
4. Statistical Bulletins on the Commerce of Brazil, Pan American Union, Washington.
5. Supplement to Commerce Reports, Trade and Economic Reviews, 1921, No. 33; 1922, No. 46; 1923, No. 32. Bureau of Foreign and Domestic Commerce, Washington.
6. Redfield, A. H., Brazil—"A study of Economic Conditions Since 1913." Miscellaneous Series No. 86, Department of Commerce, Washington, 1920.
7. Schurz, William L., and others, "Rubber Production in the Amazon Valley." Trade Promotion Series, No. 23, Department of Commerce, Washington, 1925.
8. Trade Information Bulletins Nos. 73, 92, 101, 116, 127, 148, 259, 275, 284, 296, 311, 320, 349, 379, 383, 406, and 420. Bureau of Foreign and Domestic Commerce, Washington.
9. Le Cointe, Paul; "L'Amazonie bresilienne: le pays-ses habitants, ses ressources, notes et statistiques jusqu'en 1920," 2 vols., Paris, 1922.

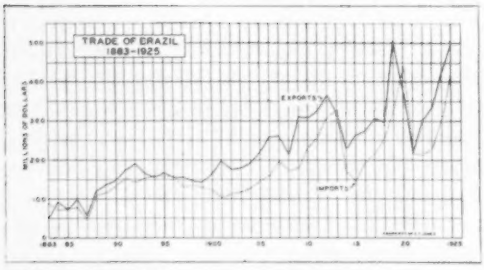

FIGURE 1.—The commerce of Brazil increased from 139 million dollars in 1883 to 915 million in 1925. The marked period of depression following 1912 strikingly shows in both exports and imports the crisis in the wild rubber industry of the Amazon Valley. The last three years indicate a complete recovery from the decrease in trade following the post-war boom.

only 3½ per cent of the land of the republic is under cultivation. Before the World War (1911–13), Brazil depended upon coffee and rubber for her place in the family of commercial nations; these two commodities constituted 82 per cent of the total exports in those years. Only a few others entered the trade in appreciable amounts—hides and skins, yerba maté, cacao, cotton, and tobacco.

In 1921–23 coffee held its own in the export trade of the country, furnishing 63 per cent of the total, while rubber had fallen to only 2 per cent of the total. However, the value of coffee exported decreased from 207 million dollars in 1911–13 to 180 million dollars in 1921–23; rubber shipments decreased by 61 million dollars. During this period other commodities have entered the export trade in increasing amounts; they strengthen materially Brazil's purchasing power and her commercial position.

RUBBER

One of the most spectacular trade developments of all Brazil was that in rubber exports,—its remarkable rise during the closing years of the nineteenth century and the opening years of the twentieth and its collapse after 1912. While the wild rubber industry of the Amazon is almost a century old, rubber did not figure prominently in Brazilian exports until about 1870. The exports increased from ten million pounds in that year to 93 million pounds in 1912, the high-water mark in the trade (Fig. 2). So long as the world's demand for rubber for bicycle and buggy tires, clothing and boots increased steadily, Brazil was able to meet the needs. She produced practically the entire world's supply until 1909.

The Wild Rubber Industry

During these years as carried on in the Brazilian forests rubber gathering was an extractive and destructive industry. Scores of alien companies exploited the area in many ways. Fortunes were made through the sale of shares and the workers were driven to the limit. Money was spent lavishly in building towns.

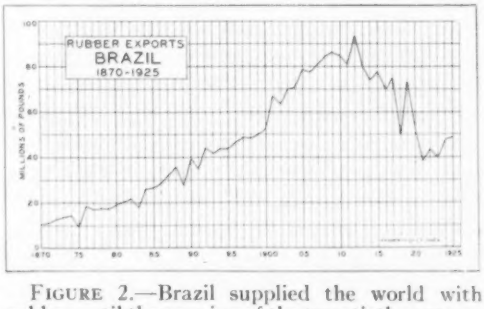

FIGURE 2.—Brazil supplied the world with rubber until the opening of the twentieth century. Increasing shipments of plantation rubber from the Middle East after 1900 and the heavy export tax on wild rubber from Brazil (amounting to as much as one-third its market value in some years) brought on the crisis in the industry from which it has never recovered and probably never will.

Inflation ruled; the industry was on a "boom"; credits were extended throughout the various branches of the rubber business, preparing the way for the disastrous crisis which followed.

Rubber had for twenty or thirty years created millionaires in Brazil; the revenues of Amazonas and Pará were swollen by the high export duties placed upon rubber—amounting in some years to one-third of its market value, while the Federal Government income grew rapidly by the taxes on the swelling volume of imports which flowed to the Amazon Valley to supply the wants of cities suddenly grown rich. While the Brazilians were enjoying their recently

acquired wealth and clamping on higher and higher duties, developments in other parts of the world were undermining the rubber trade of the Amazon.

The Crisis

Plantation rubber from the Middle East began to enter the world market in significant amounts about 1909, 3,380 tons being marketed in that year. This equaled only 4.6 per cent of the world's production. Producers in the Amazon showed little concern over the possibilities of this competition, until in the early part of 1910 when the amount of plantation rubber placed on the market was sufficient to cause a break in the high prices. This crisis resulted in the ruin of most of the rubber firms in Manãos and Pará, and also of many producers carrying extended credits.

Thus facing complete ruin, the rubber interests of the Amazon Valley appealed for government aid, and a valorization scheme was put into effect in 1911. The government attempted to accumulate and withhold large stocks from the market in order to keep up the price. Its plan failed miserably for Brazil no longer dominated the world's market. Plantation rubber had come in to grasp from Brazil her second greatest industry. No government aid or policy could stem the falling tide, and thus this great trade passed into history as had sugar in colonial Brazil and gold and diamonds in the eighteenth century.

The exports of wild rubber from Brazil decreased from 93 million pounds in 1912 to 40 million in 1923; in the former year rubber amounted in value to 20 per cent of the total exports of Brazil and in the latter only 2 per cent (Fig. 3). During the first years of the industry in the Amazon Valley, Brazil produced nearly all the world's rubber; now she supplies a bare 5 per cent.

Possibilities of Wild Rubber

It has been demonstrated beyond a doubt that wild rubber cannot compete with the plantation product. Also the wild rubber industry is unable to supply the enormous quantities of rubber demanded by the growing automobile business. Furthermore, the Eastern plantations furnish a cleaner and a more uniform article at a price below which wild rubber cannot be produced profitably, except in certain favorable localities.

The Amazon region contains enormous numbers of fine trees of both Hevea and Castilla. Yet the future production of wild rubber in the Amazon Valley will depend more upon the trend of market prices than upon the number of rubber trees. During the last two years, with the restriction of exports of the plantation product according to the "Stevenson Scheme" and the consequent rise in the price of rubber, the Amazon Valley has increased its exports a few million pounds. However, a rise in the price for only a short period does not aid greatly the wild rubber industry. Today the Amazon region lacks both capital and men. In order to increase the output materially it would be necessary to (1) collect the labor of the valley, (2) import labor from Ceara and Maranhão, (3) locate and build supply stations and stores, and (4) clear roads and trails of jungle growth. Capital to accomplish this quickly is not available, no matter how sharply the price of rubber rises.

Possibilities of Plantation Development

The physical conditions in the Amazon Valley—soil, climate, relief, drainage, and large area—are as suitable for rubber plantations as are those of the Middle East, if not more so. Vast areas are the natural home of the rubber tree and many now support fine native trees of the best kinds. There appears no physical reason why plantations should not give even better results in South America than in the Middle East.

On the other hand, economic and political conditions on the whole are not as favorable in the Amazon Valley as they are in the Middle East. The former has an inadequate supply of labor, while the latter has an abundant

supply of intelligent labor which costs less than that of the Amazon Valley. It is probable that the labor cost of bringing an area into bearing would be 50 per cent of the total cost while in the Middle East it is not 40 per cent. Land leases in Malaya are perpetual and unlimited as to area; in Brazil lands are sold or leased, the charges being graduated according to the location of the land. The area which may be obtained is commonly fixed by law. Taxes on land in the Amazon Basin are much lower at the present time than are rentals in the Middle East, while the export duties are higher in Brazil than in the East. In addition, municipal, professional, sanitary, and other taxes in the Amazon region boost the total to 18 per cent or more. Finally, political conditions favor the Middle East. There the planting areas lie within regions controlled by European Powers, giving reasonable assurance that guaranties will be adequate. The State Governments and the Federal Government of Brazil have expressed an interest in the investment of foreign capital in the rubber industry, but it is too well known that politics vary considerably between states and the Federal Government and sometimes from one administration to another.

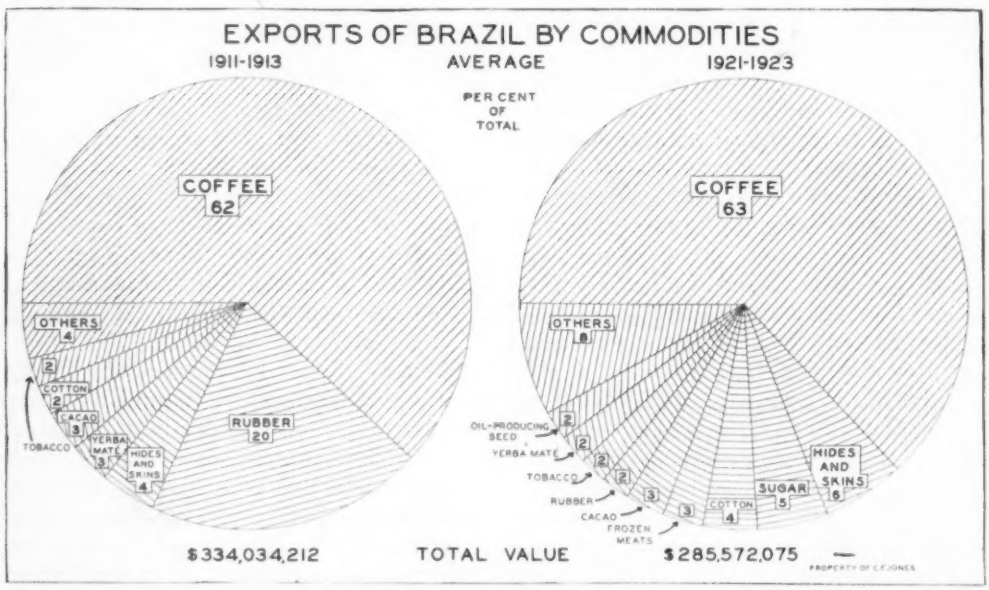

FIGURE 3.—Coffee constitutes the backbone of the Brazilian export trade. Rubber, which supplied 20 per cent of the exports in 1911–13, has fallen by the wayside. During the last two years oil-producing seeds, cotton, yerba maté, cacao, and frozen meats have moved forward in the percentage of the total shipment, while sugar has decreased. This wider distribution of the exports among a variety of articles indicates a significant commercial expansion.

However, if the restriction on the shipment of rubber from Malaya keeps prices up, capital may move into the Amazon region in the face of the preceding handicaps. Yet in all probability Brazil will not witness any great development of either wild or plantation rubber in the Amazon Valley for years to come, *if ever*.

COFFEE

The coffee business of Brazil has grown from small beginnings one hundred years ago to one of the largest of industries of the present commercial world. Since 1840 it has furnished in value from 47 to 75 (1924) per cent of the exports of Brazil. It is the leading export product of South America, constituting 16 per

cent of the total exports of the continent.

Favorable Physical Conditions

The dominant position of coffee in Brazilian trade results largely from the almost ideal conditions for its cultivation on a gigantic scale on the great tableland of east central Brazil. Here the rolling plateau averaging one to three thousand feet above sea level and sloping inland is mantled with a deep fertile residual soil of high iron and potash content, a prime factor in the production of a high-grade coffee of superior flavor. The rolling topography of the plateau surface insures free soil aeration, so necessary for the coffee plant, and protects the trees, through air drainage on the slopes, from the frosts which come in the valley.

The climate, while not always ideal, is very favorable. The rainfall in the coffee district averages 45 to 60 inches per year, the maximum precipitation coming during the summer when most needed by the growing plant. The dry sunny autumn and winter favor the harvesting, washing, and drying of the coffee, the latter processes being done in the open on large concrete floors. Summer temperatures are high, yet the elevation of the plateau and the lower winter temperatures alleviate the enervating heat characteristic of tropical regions. Owing primarily to these advantages, Brazil produces 65 per cent of the world's coffee (Fig. 4).

The exports of coffee from Brazil increased from 300 million pounds in 1850–55 (five-year average) to 1,850 million pounds in 1905–10; since then the shipments based on five-year averages show a decline, regardless of the fact that in 1915 exports were 2,256 million pounds (Fig. 5). This phenomenal rise in coffee shipments took place, owing to the mounting consumption of the beverage in northwestern Europe and especially in the United States of America, and to the wholesale planting of coffee trees on the immense *fazendas* of São Paulo.

Factors Leading Up to the First Coffee Crisis

During the early part of the preceding period the market price of coffee was good; the yield of the soil was abundant. These conditions made the extension of the plantations desirable; much virgin soil was available and immigrants supplied the necessary labor. They were the first to engage in the extension of the plantations. Wages on the *fazendas* at this time consisted of a fixed sum of money and certain cereal crops which

FIGURE 4.—The rolling surface of the highlands of east central Brazil affords almost ideal conditions for the extensive cultivation of coffee, conditions which have made it possible for this country to dominate the world's market. (Statistics of production for Brazil from, *Recenseamento do Brazil, Vol. III(2a Parte) Agricultura, Ministerio da Agricultura, Industria, e Commercio Directoria Geral de Estatistica*, Rio de Janeiro, 1925.)

were grown between the rows of young coffee trees. These products found a ready market in São Paulo; the chief object of the colonists became the production of an abundant harvest of maize and beans. Fresh soil was required and new plantations, where the annual crop would suffer less from the demands of the coffee, were preferred. The competition between laborers anxious to establish new plantations became keen and the value of such work decreased. About 1870 it was the custom for a colonist to clear and plant a piece of land and return it to the owner

about four years later with coffee trees, for which he was paid at the rate of 5 cents per stem. Thirty years later the system was adopted of leaving land for five years in the hands of a colonist, who then returned it to the *fazendeiro* without receiving any pay, his only remuneration being the crops which he

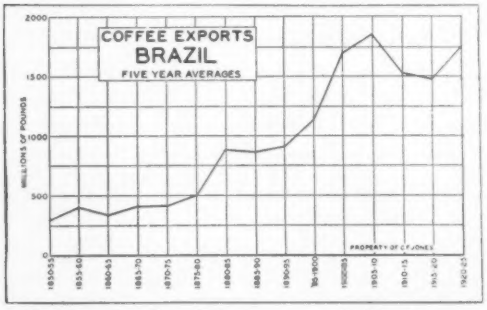

FIGURE 5.—Brazil had a remarkable increase in the exports of coffee from 300 million pounds in 1850–55 to 1,850 million in 1905–10, the high-water mark in the coffee trade. The first crisis in the industry came in the decade 1900 to 1910 with overproduction and the decrease in the price of coffee. The first valorization scheme went into effect in 1906–07; after that the coffee exports registered a decrease, averaging 1,470 million pounds in 1915–20, and 1,750 million during the last five years.

raised during those years. Therefore planters became obliged to go on planting in order to keep their laborers, and thus the number of trees increased beyond all bounds of economic reason.

Though world consumption increased, the advance in production during this period was proportionately larger, bringing about an inevitable oversupply. Thus in the crop year 1896–7, when consumption rose only about 5 per cent, world production increased from 10 million to 13 million bags, followed the next year by an increase to 15½ million sacks. Crops continued larger until 1906–7 when the total world crop was 23,800,000 bags. In addition there existed a reserve or an oversupply from previous crops of 11½ million sacks.

The Valorization of Coffee

Large stocks and falling prices led to the valorization of coffee. In 1906 the government intervened in the market and bought 8,500,000 sacks which were warehoused and sold later at a profit. The withdrawal of this huge amount forced up the price of coffee in the world's markets. It was possible for Brazil to manipulate world prices because she dominated the world's exports (Fig. 6).

After this period the steady world increase in consumption and some small crops equalized conditions so that the next valorization did not take place until 1917. All producers had been seriously affected by the fall in the European demand during the War. Large quantities again were purchased by the São Paulo Government and retired from the market, resulting in a rise in prices.

Again in 1921 valorization was considered necessary, the São Paulo Government repeating the action of 1917 on a much larger scale. Also, the government began to limit entries into Santos.

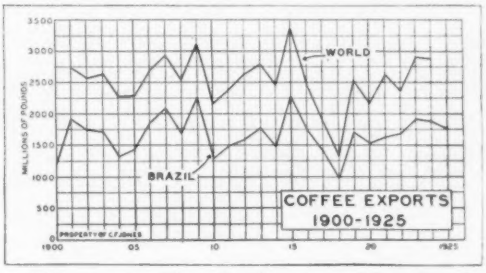

FIGURE 6.—The dominant position in the world's coffee exports has made it possible for Brazil to manipulate world prices through repeated valorization schemes. In the face of this, however, her percentage of the world's shipments is decreasing.

To do this the São Paulo Government erected nine large warehouses in the interior of the country where coffee is stored awaiting shipment to Santos. The effect has been to regularize the market and to take the control of coffee out of the hands of the growers. Before valorization 85 per cent of the coffee flowed into Santos within six months after harvest; now it must be stored in a government warehouse in the interior and released only on official order.

The final step has been the organization in São Paulo of "The Institute for the Permanent Defense of Coffee"

which plans to make loans to planters on easy conditions, to regulate entries into Santos, to purchase coffee for retention from market, and to carry on propaganda to increase the consumption of Brazilian coffee in foreign countries.

While valorization has repeatedly held up the price of coffee and saved *fazendeiros* from ruin in times of special stress, it can not be argued from this that permanent valorization is a good policy. It is unsound from an economic point of view. If the price were fixed by the law of demand and supply there would be no crisis in the long run. The only lasting security for any producer is the adoption of the best productive methods insuring low production costs and maximum output, with consequent lowest prices consistent with reasonable profit and the stimulation of the greatest possible consumption. The use of government funds to circumvent these laws of trade will in the long run work to the harm of the producer more than anyone else.

In fact, this seems to be taking place in São Paulo now. The consumption of Brazilian coffee in the United States of America, by far the largest consumer of Brazilian coffee, taking more than 50 per cent of her exports, has decreased considerably during the last year, while our imports from other coffee-producing countries have increased. Also, other Brazilian states are planting millions of trees; the surplus coffee in a year or two will be far over the largest recorded world's consumption (Fig. 7).

What São Paulo needs most is not more government manipulation of prices or stocks, but (1) an improvement in the types of machinery used, thus lowering the cost of production and offsetting a labor shortage, (2) a diversification of agriculture in the coffee regions, thus affording a better use of labor and machinery and reducing proportionately the cost of farm operations now charged to coffee, (3) the breaking the neck of the bottle—the São Paulo Railway concession prohibiting any other road from Santos to São Paulo—relieving in part the transportation congestion where the whole railway net of São Paulo focusses

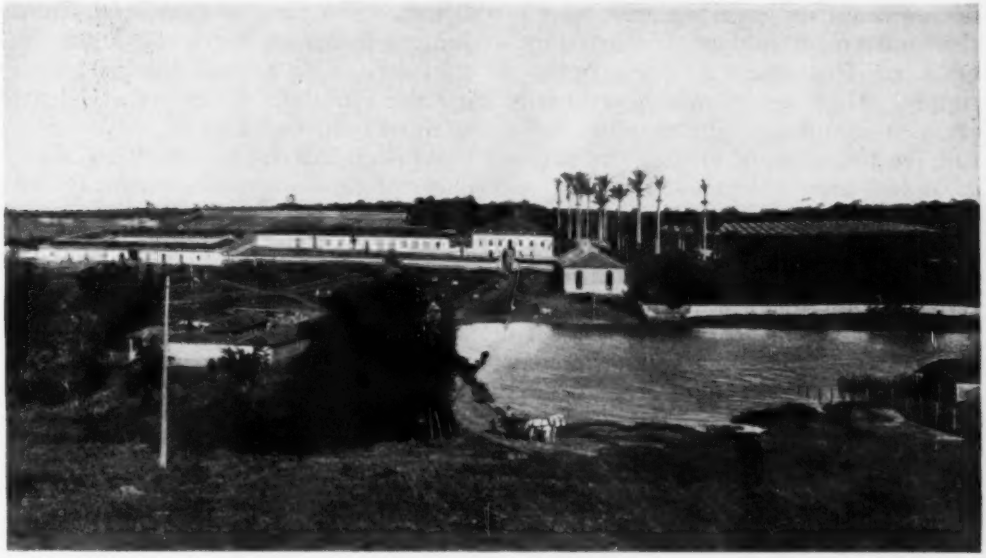

FIGURE 7.—In the rolling plateau of São Paulo are 1 billion coffee trees with space for 5 billion more. Can "The Institute for the Permanent Defense of Coffee" cope with a marked increase in production and hold up the price of coffee for all the world, or will the coffee flood finally break up the political manipulation of price and supply and cause a revolution in agriculture in East Central Brazil, to the advantage of the Republic? Fazenda "Lapa," Campinas. (Courtesy of Publishers' Photo Service.)

on the single line from that city to Santos, and (4) the adoption of certain measures to further reduce cost of production thereby meeting aggressively competition from other areas and capitalizing on the exceptional advantages enjoyed by the industry in Brazil.

Future of Coffee

Regardless of any recent trends to the contrary, Brazil is destined to dominate the world coffee market indefinitely. As far as mild-coffee producing countries are concerned, none of them has a regular influx of foreign immigration. This means a stationary labor supply. High wages which ordinarily act as a stimulus to greater effort seem to have the effect of making the native labor feel most independent and of reducing the days of work per laborer. In many of these regions the plantations are old and planting takes place slowly, giving at best a slow and small increase. On the other hand, Brazil possesses 1,300,000 square miles suitable for coffee; in São Paulo alone there are 1 billion coffee trees—twice as many as 23 years ago and most of these are in the prime of life. In addition space exists for 5 billion more in this state alone. Yet in the near future no great expansion can take place, for the world is now about saturated with coffee.

SUGAR

Sugar played an important part in the exports of colonial Brazil, at one time the chief cane sugar country of the world. It was shipped in large quantities to Portugal and then distributed to all parts of Europe. During the eighteenth century it gave way to gold and diamonds in Brazil and to competition with other sugar regions, and in the nineteenth to coffee and rubber. It all but disappeared from the exports of Brazil in 1904 and again in 1911 and 1912, increasing to 555 million pounds in 1922 through a series of good years, then dropping again in three years to less than 6½ million pounds. Sugar constitutes less than 5 per cent of the exports of the country.

Brazil now ranks fourth among countries producing cane sugar following Cuba, India, and Java. While sugar is grown in every state, Pernambuco is preëminent in its production. It is not only the largest producer and exporter, but what coffee is to São Paulo, sugar is to Pernambuco. The industry is concentrated in the eastern part of the state along the central and southern lines of the Great Western Railway of Brazil. The Campos district of Rio de Janeiro forms an important sugar district; the wide alluvial plains bordering the Parahyba River are excellently adapted to its cultivation.

While Brazil ranks fourth as a producer of cane sugar, she normally does not have a significant trade in it. A number of conditions hinder the development of a large trade in sugar. As Brazil has a very large domestic consumption, only in years of abundant yields do considerable quantities exist for export. Dry periods in the chief sugar districts reduce the output enormously in some years. A majority of the mills now operating need more modern machinery which will insure greater economy and efficiency and will enable them to increase their operations. A large development of the industry is hindered by inadequate transportation facilities—both Pernambuco and the Campos suffer from the lack of rolling stock. In addition Brazilian sugar, not being graded strictly, does not receive the welcome in the major markets that sugar from Cuba and Java does.

Finally the position of Brazilian sugar is not financially strong. Mill operators are seriously compromised by heavy obligations assumed during the last six years. Encouraged by the example of the valorization of coffee, the sugar interests have made persistent efforts to obtain government aid. After repeated efforts, a "sugar fund" project became a law in January, 1922, but it has not been executed because of the

objections it raised. This law authorized the Federal Government to purchase sugar for the purpose of maintaining the price. But Brazil can not manipulate the sugar market of the world when she supplies such a small part of the world's exports. Sugar probably will not become a significant export of Brazil for some time, even if the country does have immense areas suited to its cultivation, for fertile virgin lands in regions having better financial conditions, improved machinery, more stable governments, and adequate transportation facilities await a greater world demand for sugar to bring them into productivity.

COTTON

Cotton at the present time constitutes in value only four per cent of the exports of the country, but like sugar it is an old export commodity. The shipments in the decade 1821–30 were 120,000 tons, those of 1861–70, 288,900 tons, of 1871–80, 282,400 tons. Since 1880 the exports have decreased to only 14 million pounds in 1924 (Fig. 8). On the other hand cotton production has been increasing steadily and cotton bids fair to rival coffee as Brazil's leading agricultural crop in point of value. The production in 1924 was estimated at 167,000 tons of which 80 per cent was consumed in Brazil, leaving only a small amount for the export movement. The number of spindles in Brazil increased from 1 million in 1909 to about 2 million in 1924; these produce 90 per cent of the domestic requirements of textiles, and the exports of manufactured cotton show respectable totals.

The cotton manufacturing industry of Brazil has the advantages of nearness to raw material, cheap water power, and the largest market for cheap cotton goods in South America. Yet the industry has been built up behind a high protective tariff which makes possible a profit of 10 per cent or more.

While cotton grows in most of the Brazilian states, there are two main regions of production, one in the São Paulo Plateau and the other in the Northeast. The former zone grows American upland cotton with one inch fiber, and the latter produces first class *long staple cotton* on trees which do not require renewing for fifteen years or more. Much cotton from the latter region, if properly cleaned and baled, would compete with Egyptian cotton. Also, the yields per acre are high in both regions. But certain factors hinder a large extension of cotton acreage, —(1) the difficulty of obtaining a sufficient supply of pure seed, (2) antiquated machinery, (3) inadequate transportation

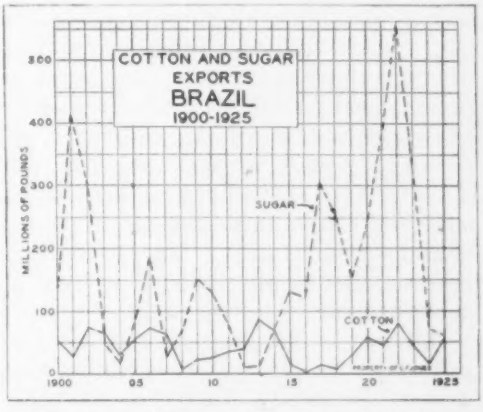

FIGURE 8.—Cotton and sugar are both important crops in Brazil, but they do not enter the export movement in a large way. The possibilities for the production of cotton for foreign markets are great. Only in years of excellent and exceptional harvests does Brazil have quantities of sugar for export.

facilities, (4) the lack of an intelligent labor supply, (5) the lack of grading and standardization for the export movement, (6) the ravages by insect pests and diseases, and (7) the lack of market organization. Natural conditions in different parts of Brazil favor a large development of the cotton industry. Cotton is the one crop best suited to fill the gap in the exports from Brazil of which the finances of the country stand in such need, and it fits well in a system of mixed farming on coffee plantations, thus relieving somewhat the financial strain of the one crop system. Yet Brazil cannot expect any significant

growth in the raw cotton export trade during the next few years.

CACAO

While cacao now constitutes only 3 per cent of the total exports of Brazil, the Brazilian shipment amounts to 14 per cent of the world's exports. The Amazon Basin at one time supplied all the world with cacao. What has happened in this industry in the Amazon region is typical of the trends in other products from tropical Brazil.

Many cacao plantations were established on the banks of the Amazon and its main tributaries in the early part of the nineteenth century. With good yields and favorable prices the plantation owners settled back in comfortable chairs and expected to continue to dominate the world's market with increasing yields without much work. It is true that some fortunes were made and the production increased to 18 million pounds in 1888. Since that time, however, the exports from this region have decreased (Fig. 9).

The outlook for the industry in this region is not bright. Most of the plantations are 70 to 80 years old and no new ones are being established. The decay of the industry here has resulted from (1) ravages of insect pests, especially a species of ant known as Quenquen which strip the trees on many plantations bare of leaves, (2) frequent floods—only in exceptional cases are the plantations found on high ground out of reach of freshets, (3) the lack of pruning, (4) the thick stand of trees, and (5) the neglect to provide shade and windbreaks. Cacao has suffered, as have many industries in the tropics that labor under such handicaps. When new regions take up the industry, the old ones must give way in the face of competition.

By 1895 the exports of Bahia had surpassed those of the Amazon region and since then they have increased rapidly to 145 million pounds; they now constitute 96 per cent of the total cacao exports of Brazil. Conditions for a large production of cacao in the state of Bahia are excellent—as good as those in other world-producing regions. Yet, in Bahia state and municipal export taxes on cacao, to the extent of 20 per cent of the export price, hinder a free development of the trade, and grant first place in cacao shipments to regions not so encumbered with uneconomic, political impedimenta.

ANIMAL PRODUCTS

In contrast to Argentina the animal industries of Brazil have played a small

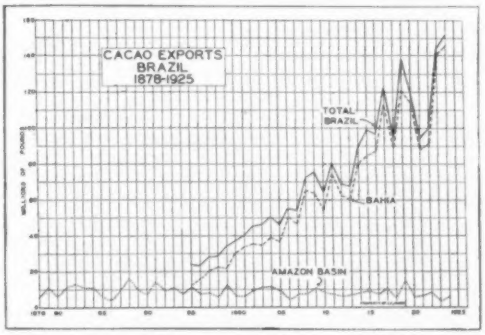

FIGURE 9.—The cacao industry of the Amazon region has been on the decline since 1888, the peak year for exports from that area. Cacao exports from Bahia registered a phenomenal growth from 1895 to 1924.

part in the export trade, in spite of the fact that she has almost as many cattle and horses, ten times as many swine, twice as many goats, three times as many mules, and one-fifth as many sheep as Argentina. While hides and skins have been shipped from early times, they have constituted only a fraction of the export trade; wool is a minor article, also, since most of Brazil lacks climates favorable for the production of a large amount of good quality wool. Nearly all of the sheep of the republic are confined to the two southern states, Rio Grande do Sul and Santa Catharina. Meats began to enter the export trade in a significant way about 1914.

Hides and Skins

Hides and skins constitute the only class of Brazilian exports which has

not shown striking fluctuations such as sugar, diamonds, and rubber. They have held consistently for more than two centuries, from third to sixth place in Brazilian exports. From 1904 to 1914 the country shipped an average of 78 million pounds each year. With the bursting in 1912 of the inflated rubber balloon of the Amazon region and with the development of the meat industry of South Brazil after 1913, the exports of hides and skins increased rapidly, amounting to 124 million pounds in 1916. Since then an average of about 110 million pounds has been maintained. The quality has improved and with it the price has advanced. Hides now hold second place in the exports of Brazil, constituting in value 6 per cent of the total in 1921–23. With the expansion of the meat industries of the country, hide exports will grow.

Meat Products

The exports of meats and meat products from Brazil increased from 2 million pounds in 1914 to 254 million in 1919 (Fig. 10). Of course, this represents production under war conditions; the shipments of canned beef and beef extract were large during these years, but with the cessation of hostilities in Europe the market for these products was largely cut off and the exports dropped to their pre-war position. The drop in shipments of other meats in 1919 to 1922 corresponds to the period of world depression. While the phenomenal rise took place under war pressure for food, packing plants have been established which are paving the way for a great expansion in the animal industries.

Brazil has enormous possibilities for the production of medium- to high-grade meats. About 25 per cent of the country supports medium to excellent grazing grasses, and much of the forest land when cleared could grow nutritious and palatable grasses. Fortunately for the animal industries the areas of grass lands are in the cooler parts of the country—in the plateau of Matto Grosso, a region undeveloped and in parts unexplored, and the rolling uplands of the four southern states of the republic—São Paulo, Paraná, Santa Catharina, and Rio Grande do Sul. In all these regions the mild climate allows open-winter

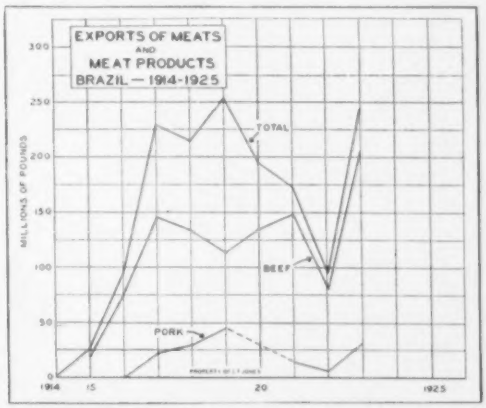

FIGURE 10.—One of the most important developments in Brazilian trade is the entrance of meat and meat products into the export movement. It signifies the opening up of the great cattle country of South Brazil, a region which will move forward with long strides during the next fifty years.

grazing, and the fairly equal distribution of precipitation furnishes forage throughout the year; South Brazil, however, is subject to rather severe droughts at times.

While the natural conditions favor the animal industries, other factors retard the realization of these possibilities. In spite of the fact that Brazil has large numbers of swine and produces huge quantities of corn, she cannot hope to enter the world's marts in the near future in a large way and compete with the United States in the shipment of pork. Furthermore, most of the cattle of Brazil are long-horned scrubs or crosses between these and the Indian zebu. They have been bred for transportation purposes with no attention to the qualities for a good meat animal (Fig. 11). Beef from these animals can not be ranked with that from American corn-fed stock or from the pure-bred herds of the Argentine alfalfa ranges. As long

as the great meat-eating population of the temperate zone can get high-grade meats from temperate grass lands, the tropical pasture lands will remain unused for the most part. However, in this connection it should be stated that South Brazil is temperate to subtropical, that the region has seven modern packing plants with millions of foreign capital invested, that pure-bred Hereford and Shorthorn cattle are being imported for breeding purposes.

Before Brazil can realize upon her great possibilities for meat production, a number of improvements must take place. The general level of the grade of cattle must be raised by the importation of pure-bred cattle in large numbers; insect pests and diseases must be studied and eradicated whenever possible. Transportation facilities must be extended; no portion of the cattle country, with the possible exception of part of the São Paulo plateau, has adequate transportation.

Yet in the face of all these economic handicaps, and with Argentina mounting to the crest of the wave in her great cattle industry, Brazil stands in a position to witness a development along this line no less remarkable than the one which took place in Argentina during the last fifty years. In 1877 Argentina began the shipment of refrigerated beef; her exports of chilled and frozen beef in 1925 were 1½ billion pounds!

FIGURE 11.—The rolling plateau country of South Brazil affords excellent conditions for an extensive cattle industry. However, before Brazilian beef can enter the world market in a large way the grade of stock must be improved through the importation of pure bred cattle. A herd of mixed cattle in Northern Rio Grande do Sul. They will at best make only French or Italian beef.

THE IMPORT TRADE

Although Brazil is the largest country of South America and has as many inhabitants as all other South American republics together, these are not criteria of the Republic's relative purchasing power. A majority of the population consists of negroes, Indians, and mestizos, who have a high degree of illiteracy, a low standard of living, and consequently a small purchasing power. A significant percentage of them live in simply constructed huts, gather a living from the tropical abundance of a few forest trees or a patch of corn and beans, and dream not of the dizzy whirl of the commercial world beyond their valley or mountainside dwelling. Thus, they demand little from the outside. The per capita import trade of all Brazil in 1925 was 12 dollars; that of Argentina 100 dollars.

While the exports of Brazil consist almost entirely of beverages, food stuffs, and raw materials for the great manufacturing regions of Europe and the United States, the imports are made up largely of numerous manufactured wares. Two significant exceptions to this general classification in the imports are wheat and flour, 14 per cent of the total imports, and mineral fuels, 12 per cent.

Manufactured wares make up the bulk of the imports despite the fact that Brazil has some of the largest high-grade iron ore deposits in the world, many other basic minerals, immense water

power resources, and extensive forest regions, and that already Brazil ranks first industrially among South American countries. Yet she lacks the resources of mineral fuels for a development of the basic manufacturing industries. As a result, they figure prominently in the import trade.

Most of the infant industries of Brazil have been developed under the protection of a high tariff wall. Import duties on many classes of goods increase the price of the commodity two to four times that in the country of production. Consequently cheaper grades of goods manufactured in Brazil under handicaps of labor, capital, and management can hold the market over such imported articles. The factories of the republic now produce 90 per cent of the cotton textile requirements, much of the jute and some of the woolen goods, nearly all of the boots and shoes, beverages, hats, tobacco, and furniture.

East central Brazil, including the State of São Paulo, Minas Geraes, Rio de Janeiro, and Espirito Santo, holds about 45 per cent of the population of the republic, but it handles three-fourths of the foreign commerce. This results in a large measure from the dominant position of coffee in the export trade and the high buying power of the wealthiest states in the Union where the population is dominantly of European extraction with a relatively high standard of living. It is this area and its people, marked by progress characteristic of the twentieth century, that calls for the major Brazilian imports.

IRON AND STEEL PRODUCTS

Iron and steel products of a large variety must enter Brazil to keep in motion the great stream of the chief exports needed by the millions of people and the mills of the leading manufacturing nations of the world. They include almost everything from needles to massive steam locomotives and constitute the leading class of goods imported with 17 per cent of the total, in spite of the fact that Brazil has marked advantages for an iron and steel industry.

Brazil holds vast stores of high-grade hematite and magnatite ores, chiefly in Minas Geraes. The estimated reserves range from 6 to 12 billion tons of hematite, a large proportion of which averages more than 60 per cent iron.

However, natural obstacles hinder a large-scale utilization of these ore resources. The Republic lacks the proper fuel supply for smelting and reduction operations. The price of imported coal precludes its extensive use. Charcoal made from wood is being used in the production of pig iron; the possibilities of the use of charcoal are restricted and would permit only limited expansion of the industry. Several electrical furnaces have been installed for making steel from pig iron.

In the face of these difficulties and others, the iron and steel industry is developing in Brazil, especially in São Paulo, where quantities of nails, screws and bolts, chains, wire fencing, agricultural implements, doors, safes, stoves, and a variety of general foundry products are being made. On the other hand, the inadequate transportation facilities from the ore deposits to the coast (a distance of 310 miles), lack of an efficient labor supply, technical skill, and capital force Brazil to depend upon foreign countries for her major machinery, railway supplies, and general iron and steel requirements.

Machinery

Machinery amounts to about 41 per cent of the total imports of iron and steel. While it includes a long list of wares, the three leading classes in order of value are industrial, electrical, and agricultural machinery.

A rather active market exists in east central Brazil for industrial machinery, for the region has many small and some large manufacturing industries, other than those which require iron and steel as basic materials. The government favors the development of these infant

industries by a high tariff on similar commodities from over seas. The population is increasing rapidly and the standard of living rising, developing a greater purchasing power.

The rapid expansion of the textile industry, the chief manufacturing industry of Brazil, calls for increasing amounts of spinning and weaving machinery of all kinds, three-fourths of which comes from Great Britain. Other industrial machines imported in considerable quantities include metal-working, oil mill, factory, sewing, shoe and sugar-mill. The sales of these types are rather restricted owing to (1) the general illiteracy and lack of technical skill and mechanical education, (2) the low cost of labor in some cases, and (3) the slowness with which new and improved machines are adopted.

A rapid development of water power, one of Brazil's greatest resources, in São Paulo, Rio de Janeiro, Paraná, and Minas Geraes has called for increasing amounts of electrical machinery. The United States furnishes that for large installations, while Germany leads with lower prices in the small electrical goods trade.

Agricultural implements do not occupy the prominent place in the Brazilian machinery trade that they do in Argentina. Throughout much of the Republic agricultural methods are crude, little machinery being used; in the Amazon Basin and the Matto Grosso country, a heavy hoe serves as the only implement of cultivation. Also, the great export crops of Brazil, in contrast to those in Argentina can not be harvested with machines. In other sections the mass of population is too ignorant to use modern agricultural machinery for the up-to-date growing and harvesting of crops. Plows, tillage implements—cultivators, discs, harrows—threshing machines and seeding machines constitute the chief imports in this line of goods. The United States supplies about three-fourths of the agricultural implements. The shortage of labor and its consequent higher cost in the chief agricultural districts have brought a growing recognition of the advantages of modern implements. To develop this line of trade one must study the Brazilian farmer and his requirements and produce articles suited to his needs.

Railway Supplies

While railway transportation is one of Brazil's greatest needs, the railway supplies—locomotives, cars, and rails—constitute only 4 per cent of the total imports (Fig. 12). The whole Republic has only 18,900 miles of railroads, half of this being in the rolling to rough plateau of east central Brazil, where relief and climatic conditions combine to make construction and maintenance expensive. While the United States has a fair share of the trade in railway supplies, it rests largely in the hands of the British, who have invested heavily in Brazilian railroads. In spite of the shortage of railway lines and equipment, most of the government and private railways are unable to purchase supplies of rolling stock; consequently the imports continue small. However, a potential market exists where economic conditions warrant railway extensions and increased services.

On the other hand, if the electro-metallurgical processes for the preliminary reduction of iron ore are perfected, Brazil has excellent advantages—immense resources of high-grade iron ore and other raw materials, large water power resources, an expanding market, a rapidly increasing population, and a growth in wealth—for the development of an extensive iron and steel industry of her own. In case this takes place she may shift from an importer to an exporter of iron and steel goods. However, such a drastic change can not be expected in the near future.

WHEAT AND FLOUR

Wheat and flour rank as the second class of goods received, constituting 14 per cent of the total imports of Brazil.

The wheat comes largely from Argentina, owing to her large export movement and to proximity and low freight rates, while the flour comes from Argentina and the United States. From 1904 to 1922 American flour entered Brazil at reductions below the duties applying to imports from other foreign countries. The preference on flour was 20 per cent of the normal duty until 1911, when it was advanced to 30 per cent. This preference was discontinued in 1923. The exports of flour from the United States to Brazil last year (1925) just equaled those in 1913.

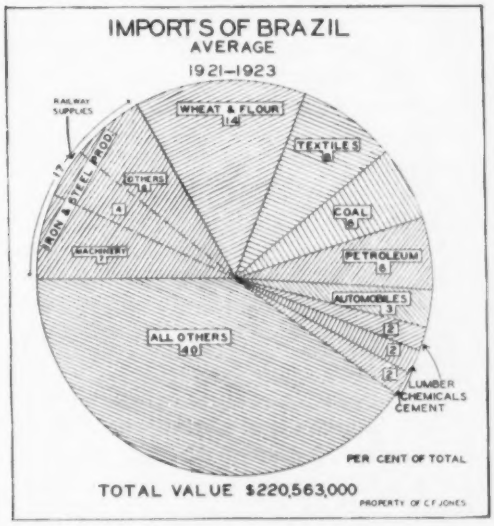

FIGURE 12.—As in Argentina while the exports consist largely of foodstuffs and raw industrial materials, the imports are chiefly manufactured wares.

A number of conditions have caused an increase in the imports of wheat and flour. The decline of wheat production in South Brazil was a prime factor. As late as 1870 South Brazil regularly exported wheat to Argentina; but the growing of wheat there was discontinued because of the ravages of disease and insect pests. Then the growth of the large cities, the advance of the manufacturing industry, and the increased immigration have resulted in a demand for wheat bread by a class formerly content with mandioca flour. The imports of wheat and flour in terms of bushels of wheat increased from 10 million bushels in 1900 to about 22 million in 1924.

With national and state government aid in producing varieties of wheat suited to the moist humid climate of South Brazil, and in coping with the insect pests and diseases, wheat production is again on the increase in the three southern states, this region supplying about one-third of the nation's requirements. A marked expansion of wheat culture here will decrease the imports of wheat and flour. However, Argentina can supply Brazil with wheat cheaper than it can be produced in South Brazil with the present poor methods of cultivation and inadequate transportation facilities.

TEXTILES

In spite of the facts that the manufacturing of textiles is the most important industry in Brazil and that the country produces about 90 per cent of all the cotton and 50 per cent of the woolen goods consumed in the Republic, the purchases of foreign textiles make up 8 per cent of the total imports. While all types of goods, from grey ducks to fancy jacquard fabrics, are produced, the strength of Brazilian manufacturers lies in the cheaper coarse goods suitable for the great mass of the population, and in these lines the domestic mills enjoy a monopoly. The imports, therefore, consist of the finer grades of yarn, threads, and fabrics. The piece goods go almost entirely into a small select market in the large cities.

Cottons constitute almost 85 per cent of the textile imports. The climate of most of Brazil is too warm for woolen goods, their use being restricted to the region south of Rio de Janeiro and they are required there for only a few months of the year. For the mass of the people silk goods are too expensive, while cotton goods are suited to the climatic conditions of the country and lie within the buying power of the people. For-

merly manufactured jute entered Brazil in considerable amounts, but now nearly all the jute bags for coffee are made in Brazil from raw jute imported from India and Great Britain.

With the extension of cotton production in Brazil, the high tariff policy on textile imports and the resulting expansion of textile manufacturing, no marked increase can be expected in the import movement. In fact, the receipts probably will decline; the imports of cotton textiles have decreased to one-third of the receipts of 1907.

Great Britain dominates the market in textiles, supplying three-fourths of the requirements. The British entered the Brazilian market long before the domestic industry was well under way, and they have kept in touch with changing conditions, eliminating by experience the fabrics in which they were no longer able to compete. They learned the changes in construction and type made necessary by the development in Brazil; they are familiar with Brazilian requirements and they manufacture goods especially for that market.

COAL

Brazil like most other South American countries, is deficient in mineral fuels. While the Republic has a fair grade of bituminous coal in three distinct fields, one each in the three southern states, the industry is not being developed in a large way. The country now produces about 300,000 metric tons a year, only one-sixth of the coal consumed in Brazil. Of course, Brazilian coal is not equal to Cardiff or Pocahontas coal, yet Santa Catharina coal costs as much in Rio de Janeiro as that from Great Britain or the United States, owing largely to inadequate transportation facilities from the mines to the market.

In spite of the fact that Brazil has 45 per cent of the area of South America and almost half the people of the continent and is the leading manufacturing country, only 1,850,000 metric tons of coal are consumed annually. The tropical climate makes the heating of homes unnecessary, most of the Brazilian railways burn wood, while the industrial plants to a large extent utilize wood or electric power. About 85 per cent of the coal imported is steam coal, the other being gas coal, briquettes, and coke. One-third of the steam coal is used in railway locomotives and the remainder in ship bunkering.

In Brazil, as in Argentina, the British dominate the coal market, although the United States sent about 587,000 metric tons to Brazil in 1925, an amount 2½ times our pre-war shipments. The strength of the British in this market results from the facts that (1) they have been in the local market for years and have built up a clientele, which means a great deal in South American markets, (2) they have close coöperation between the various activities of the industry—mining, exporting, and importing firms, all in the hands of the British, including the coal importing firms, (3) they have an advantage in shipping facilities, for most of the coal going to Brazil from Great Britain moves in tramp vessels, which proceed to Argentina for grain for European consumption, while tramp vessels taking coal from the United States find no return bulky cargo, except one or two cargoes of manganese every month. Brazilian coffee moves largely on liners and not on tramps.

PETROLEUM

Brazil is one of the chief South American markets for petroleum and its products, being second only to Argentina. The Republic imported in a recent year approximately 22 million gallons of gasoline, 30 million gallons of kerosene, 7 million gallons of lubricating oils and greases, and 47 million gallons of gas and fuel oils. Petroleum receipts make up about 6 per cent of the total imports of the country (Fig. 12). The United States supplies practically the entire petroleum market, excepting for fuel oil, the larger share of which comes from Mexico. United States' concerns domi-

nate the trade owing to their large resources and the activities of the different companies. The Standard Oil Company which operates through Brazil is the Standard Oil Co. of Brazil, a direct subsidiary of the Standard of New Jersey. The Standard Oil can has penetrated the innermost recesses of the Amazon region where it enters intimately into the life of the country. However, 75 per cent of the petroleum imports enter Rio de Janeiro and Santos to serve the great consuming area of East Central Brazil.

Brazil must rely on foreign sources of petroleum. No important petroleum deposits have been reported in Brazil. While investigations have shown that the Brazilian oil shale deposits are rich and that they cover extensive areas in Bahia, São Paulo, and the southern states, the exploitation of these resources is yet to be made, presumably by foreign interests and capital. It is thought that the hope of a future national fuel supply lies in the development of these oil shale deposits. Until this takes place, Brazil will import increasing quantities of petroleum products to meet the needs of the expanding industries, augmented shipping, and the increasing number of automobiles.

AUTOMOBILES

A striking development in the import trade of Brazil during recent years has been the receipts of automobiles. The imports increased from 366 cars in 1907 to 18,880 in 1925 (Fig. 13). They are being generally introduced into all the large cities where they replace the slow moving horse-drawn vehicle. A stranger often finds it easier and cheaper to take a taxi in Rio de Janeiro than in many American cities. However, they have not entered the country districts in large numbers owing to the difficulties of travel on the rolling plateau during the rainy season and to the lack of even fair highways. In the more remote parts of Brazil no highways exist; even São Paulo, the richest and most progressive state of the Republic, has only approximately 4000 miles of roads suitable for motor traffic.

The United States dominates the Brazilian automobile market, supplying from 90 to 95 per cent of all the cars. United States' concerns have gained control of this trade through improvements in styles over the old European cars, the cheaper prices compared to European makes, excellent service, a well-managed advertising campaign, and in some cases selling on the installment plan, the establishment of gas-filling stations at convenient places in Rio de Janeiro and São Paulo to facilitate its purchase and the establishment in Brazil of the Ford and General Motors plants.

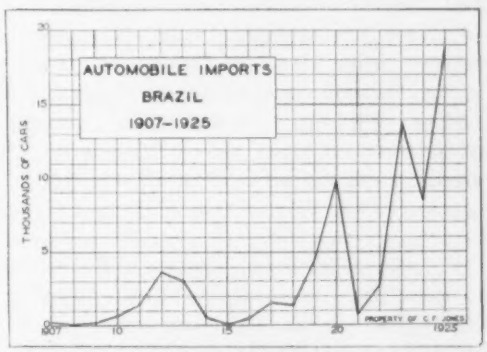

FIGURE 13.—The rapid increase in the imports of automobiles by Brazil in recent years is similar to that in Argentina, though not on the same scale. Brazil takes about one-fourth as many cars as Argentina.

The principal factors governing and restricting the market for motor vehicles in Brazil in normal times include the low purchasing power of the average citizen, the lack of a system of good roads, the numbers of old European cars still in use, the high cost of gasoline, and the expense of upkeep owing to a lack of mechanical skill of the chauffeurs. Even in the face of these disadvantages, it is believed that the imports of automobiles will continue to increase rather rapidly.

TIMBER

While more than one-half of the area of Brazil supports a forest covering,

lumber and timber products, chiefly soft wood from the United States, comprise 2 per cent of the total imports.

Approximately 80 per cent of the forests of Brazil consists of tropical hardwoods of many varieties. They stand in regions remote from the centers of population and efficient means of transportation. Because of the extreme hardness of the timber, the high specific gravity (many tropical woods will not float), and the lack of pure stands of any one kind of species, as in all tropical regions, the tropical forests of Brazil remain almost entirely unutilized; lumbering probably can never become an important industry in the Amazon region. East Central Brazil, therefore, can not look to the remote interior for lumber.

On the other hand, on the rolling plateau of the states of Paraná and Santa Catharina, the Republic holds the largest stand of commercial softwood timber in South America. The pure stands of the Paraná pine (*Araucaria brasiliana*) in this region afford a timber reserve of 860 billion board feet, with at least 300 billion feet suitable for high grade commercial purposes.

The Paraná pine lumber industry has grown rapidly during recent years. In Brazil, formerly one of the most important markets for yellow pine from the United States, Paraná pine dominates the market. Not only has it replaced American timber in the Brazilian market, but it enters Argentina and Uruguay in large quantities. About two-thirds of the output is used in Brazil, while the remainder moves to these two countries.

On the other hand this pine probably will not totally replace southern pine and other high-grade American softwoods, for it is classed as ordinary construction timber and does not serve the many special purposes for which other softwoods are better adapted. However, the Paraná pine industry during the next ten years will expand rapidly and before the end of that period the Brazilian product will have replaced much of the Northern Hemisphere lumber, now on the market in Brazil, Argentina, and Uruguay.

Brazilian Commerce by Countries

While many nations share in the trade of Brazil, five countries—Germany, the United States, Great Britain, France, and Argentina—take 72 per cent of the exports and supply 78 per cent of the imports. Western Europe, the greatest trade magnet in the world for foodstuffs and raw industrial materials, receives 46 per cent of the shipments of Brazil and furnishes 53 per cent of the imports. Portugal, the country which dominated Brazilian commerce throughout all colonial times, now occupies a minor place in the trade, handling only 2 per cent each of the exports and the imports. Brazilian intra-continental trade is small but expanding.

THE UNITED STATES

The United States leads all countries in the commerce of Brazil, taking 40 per cent of the exports and supplying 26 per cent (1921–23) of the imports. The United States has long been the chief purchaser of Brazilian goods, but before the war it was third in supplying articles to Brazil. During the war much of the import trade which hitherto had been in the hands of the British and the Germans was transferred to American firms. The war practically eliminated Germany as a factor in Brazilian commerce. Great Britain curtailed shipments in many lines, while Brazilian industries received a great impetus. Thus it fell to the United States to become the chief supplier of Brazilian imports, a position she held from 1915 to 1922.

The importance of the United States as a Brazilian market is indicated by our share in her leading exports. The United States takes about 50 per cent of the coffee shipments (Fig. 14), 34 per cent of the hides and skins, 15 per cent of the sugar, 60 per cent of the

cacao beans, 55 per cent of the rubber, and practically all the manganese ore. Our heavy purchases of these items results from the heavy consumption in the United States and the lack of production, especially of coffee, cacao, rubber, and sugar. In addition we import Brazil nuts, castor seed, carnauba wax, and a host of minor articles, of tropical origin. The leading items, coffee and cacao, classed as semi-luxuries—yet most coffee drinkers will have their several cups of coffee—register a decrease in consumption with a market increase in price, resulting in a fluctuating movement from Brazil to the United States. These two commodities do not move out of Brazil according to the law of demand

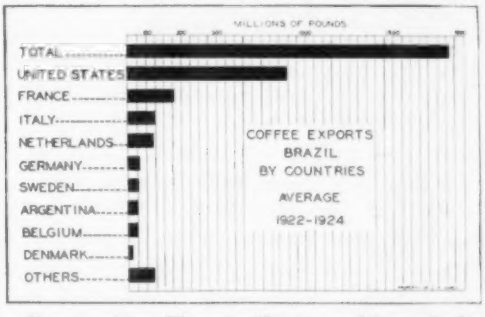

FIGURE 14.—The significant position of the United States in the export trade of Brazil, results from the fact that the United States takes one-half of the coffee, the leading item in the trade. All countries of western Europe, except Great Britain, purchase considerable quantities of coffee.

and supply, owing to the "Institute for the Permanent Defense of Coffee" and to the 20 per cent export tax on cacao from Bahia. Coffee amounts to about 88 per cent in value of the total exports of Brazil to the United States. It is no wonder then that Brazilian officials become alarmed when "Valorization of São Paulo Coffee" increases the price to such a point where consumption in the chief market of the world decreases. The consumption of coffee in the United States decreased almost 1½ pounds per person from the latter part of 1923 to the end of 1925. Consequently, the coffee imports from Brazil decreased 12 per cent in quantity in those years, but the value increased from 110 million in 1923 to 185 million in 1925.

The chief imports from the United States include in the order of value petroleum products, automobiles and parts, machinery and other iron and steel products, wheat flour, electrical goods, and coal. Brazil looks to the United States for increasing quantities of gasoline, kerosene, and lubricating oils, the United States having the lion's share of the trade. In the automobile and accessories market, agricultural implements, rubber goods, and some lines of electrical machinery, the United States has almost complete control, but in most other lines of goods there is keen competition with the manufacturing countries of Europe. Distinctive American styles, lines of standard, high-quality goods, peculiar only to those from the United States, excellent service with parts and repairs, and the entrance of American capital into Brazil in considerable quantities have initiated this trade development and are paving the way for a greater expansion in the growing Brazilian market.

GREAT BRITAIN

While no country stands on a par with the United States in taking the exports of Brazil, Great Britain has led all countries in supplying goods to Brazil, except for a few years. In 1915 the United States took the lead and held it to 1922; in 1922 and 1923 Great Britain regained first place, but in 1924 the United States passed her rival. On a three-year average, 1921–23, Great Britain supplied 24 per cent of the imports and took 8 per cent of the exports of Brazil; in 1910–12 the percentages were 27 and 17 respectively (Figs. 15 and 16).

The British will have their tea from *British India*, and as a result they do not purchase large quantities of coffee, the backbone of the Brazilian export trade. They buy in the order of importance, cotton, sugar, Brazil nuts, rubber, and frozen meats, taking 52 and 40 per cent respectively of the leading

two items. The prospects for a marked increase in sales to Great Britain are not great, except for raw cotton and possibly sugar. The market for Brazil nuts is restricted. This is true also of Brazilian rubber because of the British supplies of plantation rubber from the Middle East. Brazil, as yet, does not produce quantities of high-grade meats suited to the choice English markets; it will be some time before the herds of cattle in Brazil improve to the point of entering the high-grade chilled beef trade for British consumption. On the other hand, a shortage of cotton for the English mills will draw British capital into the cotton industry of Brazil, and Brazil's excellent advantage for the production of this commodity will give it a place of increasing importance in the trade of the country.

Great Britain entered the Brazilian market ahead of most other countries years ago with various lines of manufactured wares. In addition, British investment in railways, industrial plants, and bonds, the enterprising English colony in Brazil and shipping facilities have held a good market in spite of the fact that the British purchased only 8 per cent of the exports of the country in 1921–23. The chief shipments of British goods to Brazil include in the order of value wool, cotton textiles, raw jute (from British India), tin plate, small tools and utensils, and 70 per cent of her textile machinery. In other words in the kinds of goods which the British handle they trade with a pace that hobbles most would-be competitors. In addition to these articles the British sell appreciable quantities of many other commodities—industrial machinery, chemicals, codfish, and railway cars. They are firmly established in Brazilian commerce and will be able to hold their place in competition with the United States and neighboring European countries.

GERMANY

Germany in 1910–12 was well established in Brazilian trade; in the export movement she was third, taking 14 per cent of the Brazilian shipments; in the import trade she was second, supplying 17 per cent of the receipts. German banks, German investments, immigrants, cheap goods, long term credits, commercial activities, and efficient shipping facilities had gained a strong foothold in Brazilian commerce for the German merchant. Of course, during the war Germany was eliminated in Brazilian commerce, owing to the displacement of shipping tonnage and the effective Allied blockade.

Germany, although very active in the Brazilian commercial field, has not regained her pre-war position. The country now stands fourth as a purchaser of Brazilian goods and fourth as a source of manufactured wares, having been replaced in the import movement by the United States and Argentina, and in the export trade by France (Figs. 15 and 16). She takes only 7 per cent of the exports and supplies 9 per cent of the imports.

While Germany is not a leader in buying most Brazilian commodities, she takes small quantities of nearly everything Brazil has to sell; she leads in the purchases of palm nuts and tobacco, taking three-fourths and one-third, respectively, of these articles. The leading commodities moving to Germany in the order of value include coffee (Fig. 14), hides, palm nuts, tobacco, cacao, and frozen meats, entirely raw industrial materials and foodstuffs. Germany, like Great Britain, is a manufacturing nation and must look to overseas sources of raw materials and articles of food, though not to the same extent.

In return for these commodities Germany sends to Brazil industrial machinery and general machinery, paper (she leads other countries in the paper trade), wire, tools and hardware, chemicals and cement, and a host of minor wares. In many of these lines she is a strong competitor of the United States and Great Britain, not so much in quality, but in price. She places cheap grades in the Brazilian trade by the side of better

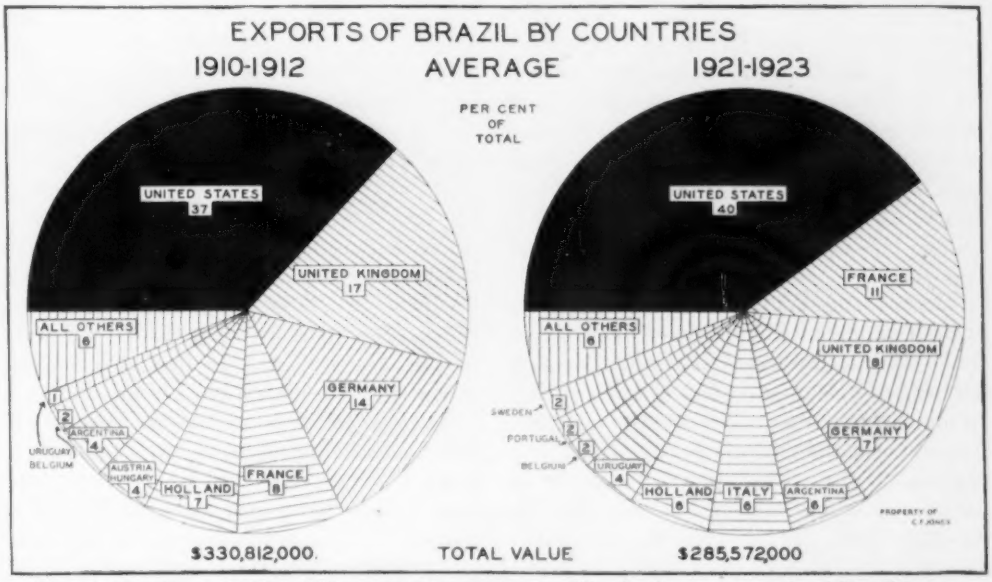

FIGURE 15.—Some striking shifts took place during the War in the export trade of Brazil by countries. The United States held first place throughout. France moved from fourth to second place while the United Kingdom dropped to third place.

articles of the same class from the United States, and since the Brazilians as a class buy largely according to price, paying little or no attention to the character and lasting qualities, these goods check the sales of better articles. As long as the Brazilians buy on this basis the Germans will continue to ship articles of this character. Heavy investments in local industries, long-term credits (three to six months), good packing, and quick deliveries aid the Germans materially

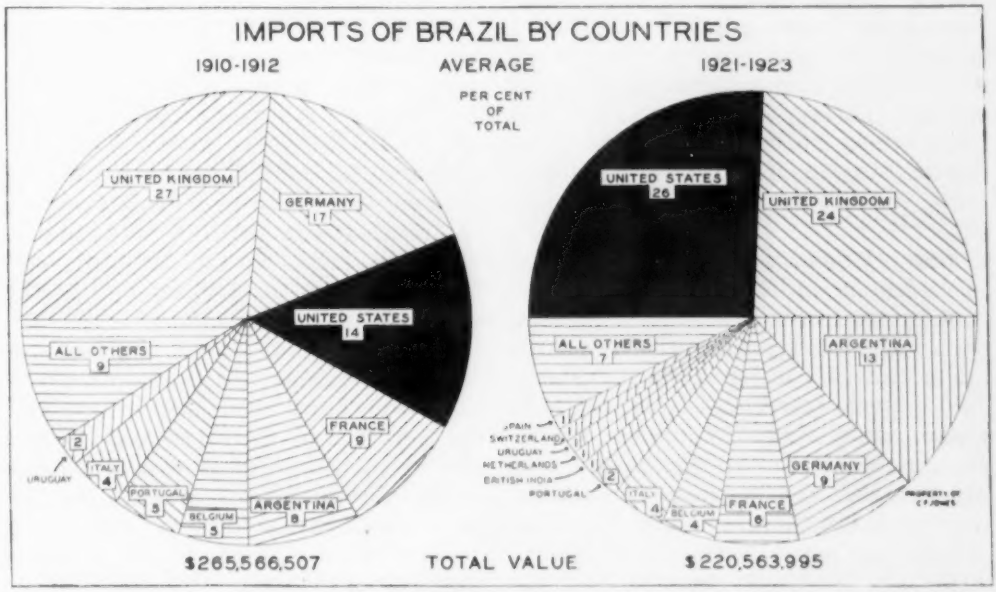

FIGURE 16.—The United States, third in rank in supplying goods to Brazil before the World War, now holds first place. The distribution of the trade among a large number of countries after the War indicates a broadening of commercial relations.

in their trade come-back. Also the large German element in the population of South Brazil and the immigrant look to the home country for manufactured wares. But Germany, having lost valuable resources and colonial possessions, will not regain her pre-war position in Brazilian trade for some time.

FRANCE

Before the World War France held fourth place in the trade of Brazil; in 1921–23 France stood second as an importer of Brazilian commodities and fifth in shipments to that country. Since the war she has vied with Argentina and Germany for third place. France is second as a market for Brazilian coffee, taking about 15 per cent of the total; coffee constitutes 78 per cent of the total exports of Brazil to France. One-fourth of the frozen meat exports of the Republic go to France and another one-fourth to Italy, owing chiefly to the low-grade cattle which do not dress into high-grade "continental" or English beef. The other leading exports to France include hides and skins, cotton and cacao. In the return trade France sends high-grade textiles, chemicals, drugs, perfumes, fine leather goods, novelties, and notions. As in Argentina, the élite in Brazil look to France for this line of goods and for the very latest in styles. This gives France a firm hold on certain channels of trade which are rather permanent.

OTHER EUROPEAN COUNTRIES

Italy, Holland, Belgium, and Portugal in descending order of importance share in the commerce of Brazil in a significant way. The leading three are heavy buyers of Brazilian coffee, hides and skins, cacao, meats (especially Italy and Belgium), and tobacco. Portugal takes sugar and cotton. In return for these raw materials and foodstuffs these countries send manufactured wares of a great variety. In some lines one country dominates the trade: Belgium leads in railway cars, rails, and railway supplies, with more than half the total and in glassware, while Italy and Portugal supply two-thirds of the wine requirements of Brazil. This wide distribution of trade among countries affords Brazil an expanding market for new industries and new products.

INTRA-CONTINENTAL TRADE

Brazilian trade with other South American countries is confined almost entirely to Argentina and Uruguay. These two republics handle 11 per cent of the exports and 14 per cent of the imports. This trade results largely from the difference in climatic conditions between the pampas of the temperate zone and tropical Brazil. These countries ship wheat and flour and tanned pelts and skins, while Brazil sends coffee, yerba maté, cacao, timber, and lumber, and small quantities of tropical fruits. With the development of Brazilian industries and agriculture, the intra-continental trade will expand.

THE OUTLOOK

Still young, with almost half the area and half the population of South America, Brazil stands upon the threshold of her greatest development. Brazil possesses, perhaps, more undeveloped resources and a larger area of untenanted land, where nature in all her beauty and power still rules unsubdued, than any other region of the world. Only 3½ per cent of her soil under cultivation gives her second place in the commerce of this southern continent. Enormous iron ore beds, other mineral deposits, and immense water power resources of the old Archean shield of east central Brazil lie dormant as they have in the long ages past. The fertile soil of the extensive campos of the Matto Grosso country and the agricultural and other possibilities of the vast Amazonian region remain practically untouched, largely unoccupied, and in part unknown.

Yet from the standpoint of the commercial development of Brazil during the present century, the Amazon Basin must be eliminated as a significant factor.

If the products entering into commerce in the near future remain essentially the same as those in demand at the present time, the Amazon region holds no "bonanza" for the production of these commodities. The physical environment of this area favors the production of many of these articles, such as tropical fruits, cacao, sugar, low grade meats, cotton and other fibers, and rubber, but the world's supply of some of these is derived from areas relatively insignificant in extent and having equally favorable physical conditions. Large areas of virgin lands in other parts of the world lying nearer the major markets and having transportation facilities, good political conditions, a labor supply, and capital can meet the world's demands for these commodities for a long time.

The whole Amazon Basin is sparsely populated and avoided by the European immigrant and will continue to be until the vacant areas of temperate countries and South Brazil have been occupied. Therefore, any great development of the Amazon Basin, in all probability, must be relegated to the distant future.

The Brazil of the twentieth century is the rolling plateau of the east central and southern part of the Republic. Here have developed the great agricultural and industrial enterprises of the country. This region holds the valuable mineral deposits, the rushing rapids and plunging falls of potential hydro-electrical energy, the fertile red plateau soils unturned by the plow and the extensive pasture lands ungrazed by pure bred stock, the largest resources of softwood timber in South America, a long coast line with magnificent harbors, the entire railway mileage of the Republic, a healthful climate favorable to European colonization, all the population primarily of European extraction—truly, a notable combination of striking advantages for a magnificent advance among the family of nations. However, in the face of all these advantages a number of conditions hinder an early realization of the full possibilities of the region.

While Brazil has half the population of South America, she needs people—a strong, sturdy people, like the better European immigrant, to bridge the wide gulf between the illiterate, inert mass of the lower classes which include a majority of the population, and the rather spiritless, extravagant aristocracy of planters and plutocracy of business and finance. To achieve its destiny, Brazil must elevate the human standards by education, sanitation, and selective immigration and prepare the way for the hundreds of thousands of European immigrants now seeking entrance to this southern continent. Let the states of South Brazil hold out to the proper immigrant at a nominal fee a parcel of land for a permanent home and they will have set the stage for a development that will startle the world.

Brazil suffers from inadequate transportation facilities. The country has only 18,900 miles of railroads. Railways have touched only the fringe of eastern Brazil and in this area three different gauges exist, making practically impossible the development of a system of roads. The potential crop lands of the south and the pastures of western São Paulo and Matto Grasso cannot be brought into productivity, until means of shipping the fruits of the farm and the range have been provided.

For a full realization of the advantages conferred upon her by nature, Brazil needs less political manipulation of prices and stocks of the leading export commodities and less interference with the currents of commerce. Excessive export duties by individual states and municipalities brought ruin to some of the great enterprises of the country. The rubber industry of the Amazon Valley was in part a victim; the cacao business in Bahia suffers under a 20 per cent export tax; the coffee producers groan under valorization and the official storage and release of stocks at the government warehouses. With all its advantages, few areas in Brazil possess sufficiently favorable natural conditions

so that one-fifth to one-third of the value of the commodity can be exacted from the industry as export taxes, and yet have it compete successfully in the world marts with areas equally favored by nature and unhindered by political impediments to the free-flowing currents of trade.

If Brazil can meet these three major needs—a virile population, transportation facilities, and stable government with economically sound trade policies, she will move forward with strides that will surprise even the fast-moving commercial world of the twentieth century. With these and her resources, Brazil could become the industrial and commercial master of the southern hemisphere!

BOOK REVIEWS

VIDAL DE LA BLACHE, P. *Principles of Human Geography.* Edited by Emmanuel de Martonne and translated by Millicent Todd Bingham. XV and 511 pp. and maps. Henry Holt and Company, New York, 1926. 8¾ x 6 inches. $5.00.

Whatever else may be said of this work, it is an outstanding contribution to the literature of geography. Like the works of Ritter and Ratzel and Semple, it has exercised a profound influence upon the geographers of this generation, and directed the trend of geographic research and exploration. To receive it in English translation is a source of satisfaction to the whole profession in America and all English-speaking lands.

Dr. Bingham has done well in the work of translation. Whether or not Dr. Martonne has done so well in the editing is a matter for the critical student to judge for himself. Certainly the inaccuracies and other faults that may be found should not be attributed to the translator, and undoubtedly these faults do occur.

Twenty chapters comprise the book. A single chapter constitutes the introduction; six chapters are grouped under Part I as the "Distribution of Population"; six under Part II as "Elements of Civilization"; six under Part III as "Transportation and Circulation"; and one, "Fragments," concludes the series.

These twenty chapters make fascinating reading, and thanks to the author, the editor, and the translator, not a single page is dull or unprofitable. The book should be in every library. Every geographer will need a copy for constant reference. Every layman would benefit by reading it thoroughly. It is a notable work.

W. ELMER EKBLAW.

HUNTINGTON, ELLSWORTH, and WILLIAMS, FRANK E. *Business Geography.* Second Edition, ix and 616 pp. Diagrams, maps, tables, index. John Wiley and Sons, Inc., New York, 1926.

The second edition of *Business Geography* by Huntington and Williams is a distinctive contribution to the field of economic geography. It is practically a new book, because the first half is entirely new. It differs markedly from the first edition (1922) in that (1) the treatment of relief, soils, and minerals has been enlarged, so that they receive as much attention as climate; (2) new tables of production have been made; (3) several new chapters have been added on the distribution of the world's chief products; (4) numerous new maps and diagrams have been added; (5) all photographs have been omitted; (6) the material on the United States has been expanded, and (7) the tables in the appendix have been revised and brought up to date.

The book is divided into five parts. Part I (169 pages) shows how the natural environment influences the distribution of human activities in the business of getting a living. Part II (132 pages) deals with the products of the world, with special emphasis on the distribution of the chief commodities and the reasons for their abundance in specific regions. Since each great product encourages particular types of human activity, Part II also deals with some of the more prominent types of communities, types which in modified forms exist in many parts of the world. Thus with Parts I and II treating principles, products, and types of communities, we are brought naturally to Parts III and IV (83 and 85 pages respectively), regional studies of the United States and of the World. These last two chapters, while approaching regional geography, describe only the outstanding factors affecting production, consumption, and trade in these large regions. Part V (97 pages), which consists of 48 valuable tables of data on area, population, government, money, immigration, urban distribution, race, occupations, use of the land, land values, farm tenure, agriculture, forest resources and production, mining, quarrying, manufacturing, transportation, commerce, consumption, finance, education, and health, is linked up with the excellent though comprehensive exercises and problems at the end of each chapter.

In its organization, *Business Geography* differs from all other texts in economic geography. Whereas they treat the subject either by commodities or countries, this book combines the advantages of both, and in addition unceasingly stresses geographic principles. The reviewer feels that this text, more than any other in the field, enables the instructor to combine *easily* and *systematically* in one course principles and economic geography. This fact is especially significant in many schools of business administration, which require a course in economic geography, but make no allowance for the essential course in principles.

Most of the maps are good, but those showing the distribution of crops (pages 213, 214, 220, 222, 226, 228, 233, 234, 235, and 237) and of livestock (pages 192, 197, 202, and 206), lose much of their value, because the dot equivalent is not indicated and no dates are given,—an unfortunate situation, since production varies from year to year. The map (page 294), showing the distribution of petroleum pipe lines in the United States, should have been brought up to date; it fails to indicate the line extending east from the Wyoming field.

Naturally in a book with such a wide scope, several errors occur. Thus we are told that the "great North American wheat region is split into two areas, hard spring wheat to the north, and

softer winter wheat to the south" (p. 216). The latter part of the statement fails to account for the production of *hard* red winter wheat in the Central Great Plains area, where more than 17,000,000 acres (nearly one-third of the American acreage in wheat) are planted annually. On page 220, one reads that "in every province of Canada except Nova Scotia and British Columbia, oats are one of the three most valuable crops. In *Winnipeg* and Saskatchewan they provide about a fourth of the total value." Obviously Manitoba should be substituted for Winnipeg. We also note on page 226 that the climate of France is too *warm* for potatoes. This statement can hardly be accepted by those who are acquainted with the climate of most of France. One learns on page 152 that "Among these mountainous routes the Denver and Salt Lake Railway follows the Old Mormon Trail, and is relatively direct, but the fact that it climbs to 13,000 feet had much to do with its going into the hands of a receiver in 1915." The authors probably refer here to the Denver and Rio Grande Railway, but it does not follow the Old Mormon Trail.

The reviewer questions the wisdom of omitting photographs. Among the absolute essentials of a geographer, a carefully selected photograph ranks second only to the laboratory—the field. Certain concepts can be comprehended only by the use of pictures, if one cannot be in the field. The authors, however, believe that for mature students a good map is generally of more value than a photograph.

The authors of *Business Geography* are to be congratulated upon this original, well organized, scholarly, and intensely interesting text, which should and undoubtedly will be widely used in the colleges and universities of our country.

LANGDON WHITE.

New Map of China

A map of China showing recent boundaries has been difficult to obtain readily. Such a map is being issued by Rand McNally & Co. It has been revised in coöperation with the Geographic Section of the Bureau of Foreign and Domestic Commerce. The latest boundaries of the various parts of China are shown on it, including the special administrative districts, also the best information obtainable as to railroad routes. The color scheme of the map is especially pleasing, a pale yellow being used for China and a fine red line for the boundaries. This map is one of the pocket series published by Rand McNally & Co.

HELEN M. STRONG.

DEPARTMENT OF COMMERCE

Recent Publications

Commerce Yearbook, 1925

The fourth issue of the Commerce Yearbook has just appeared. It has been in considerable demand by American business men, economists, geographers, publicists, editors, and others, as it presents an authoritative economic review of the year in the United States and throughout the world. It has proved of assistance in laying out long range programs for the stabilization of industry and trade, and because of the information it contains has been used to a large extent in the universities in connection with schools of business, and courses in geography and economics. It incorporates statistical information originally collected by numerous government bureaus, trade associations, and trade journals.

Some of the topics treated are production, employment, and domestic trade; wholesale, retail, and foreign prices; foreign trade, with the general movement of this trade, an analysis of its commodity and regional aspects, and the relation of exports to production. The principal commodities and groups of commodities entering into foreign trade are given separate attention. The question of transportation and communication is discussed somewhat at length. Finance and banking, including the banking situation, discounting money rates, securing markets in the United States, Government finances, are also handled. One section treats the international trade of the world in 1924. A considerable portion of the book is given over to economic reviews on statistical data for all the more important foreign countries. Maps and graphs illustrate the text. The price is $1.00.

Commercial Travelers Guide to Latin America.

Revised edition 1926. This handbook contains much information of value to the geographer as well as to the traveler. There are many maps. The transportation question is handled thoroughly, names of railroad and steamship lines both being given. There are also detailed descriptions of the various countries, lists of United States consular offices in Latin America, a bibliography of Latin American material, and an index to cities and towns. The price of this is $1.25.

Rubber Production in Africa, by H. N. Witford and Alfred Anthony, Trade Promotion Series No. 34.

Up to 1912 Africa stood second to South America in the amount of rubber supplied for world consumption, but since 1910 there has been a gradual reduction in rubber exported from Africa. The total African production was contributed by some twenty-five different political units. The main source of this rubber was a belt extending across the continent and reaching from 8 degrees north of the equator to 6 degrees south thereof. From the standpoint of transportation facilities, the countries bordering the Gulf of Guinea are the most favorably situated. In general, however, the coastal lands of these countries are not suitable for heavy production as well as the lands to the interior. It is estimated that at least 38,000 acres of land in the equatorial belt of Africa is planted with Hevea, a large share of which has

been interplanted with other crops, mainly coffee, cacao, and rubber of other species than Hevea. This bulletin assembles information regarding present and potential rubber producing areas in Africa, describing their topography, climate, labor conditions, and other aspects pertaining to production of rubber. The price is 25 cents.

Meat Marketing in Great Britain by J. E. Wrenn and E. C. Squire, Trade Promotion Series No. 35.

This bulletin contains much indirect information of value to the geographer. American pork must compete in world markets with pork from Denmark, Ireland, Canada, Netherlands, Sweden, and Jugoslavia, and is indirectly affected by shipments of beef and mutton from South American and Australia. Because of these world relations, meat marketing practices in Europe are of interest to American producers and exporters, and this is especially true of the market in Great Britain, since that country is the world's largest consumer of surplus meat production. The present study describes meat marketing practices in the United Kingdom where most of our export meats are absorbed, and analyzes their status in relation to the domestic situation there. The price is 10 cents.

The following Trade Information Bulletins contain much information of geographic interest and may be obtained for 10 cents each.

Title	*Author*	*T. I. B. No.*
Latvian Timber Resources and Trade	C. J. Mayer	408
Forest Policy of Finland	Emil A. Kekich	
Butter and Cheese Markets in South America	M. A. Wulfert	406
Markets of the Dutch West Indies	H. P. MacGowan	405
Shipment of Samples and Advertising Matter to Europe	Roberta P. Wakefield	145 (revised)
Resources and Trade of the Philippine Is.	M. A. Pugh	410
United States Trade with the British Empire in Hides, Skins, and Leather	J. Schnitzer	422
Central Light and Power Plants in Africa	Howard E. Way	423
Furniture Markets of the Far East	Kenneth M. Hill	424
Transportation and Communication in the United States, 1925	Reprint from 1925 Yearbook	425

All of the above may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C.

OUR CONTEMPORARIES

THE GEOGRAPHICAL REVIEW

Vol. XVI, No. 3. July, 1926

Irrigation and Population in the Faiyûm, the Garden of Egypt. 11 pages. A. E. R. Boak.

The correlation of occupation of the Faiyûm with application of efficient means of irrigation, and that of decline in prosperity and abandonment of the region with the breakdown of irrigation systems has been traced by Dr. Boak in three distinct strata of ruins in the alluvial and eolian deposits of the Faiyûm. With present reclamation, another stratum of development is being added.

Out-of-the-World Villages of Atacama. 12 pages. Earl Hanson.

An interesting description of economic and social life in the isolated villages of northern Chile.

The Ahaggar: Heart of the Sahara. 16 pages. E. F. Gautier.

Mr. Gautier adds to his other valuable contributions on northern Africa, this brief regional study of the central highland of the Sahara. The tools and equipment of the people and their social customs suggest the relict character of the inhabitants, while abundant evidence exists proving the residual character of certain of the physical features and types of fauna.

Water Conservation in Sardinia. 7 pages. Marcello Vinelli.

Three hydro-electric projects involving the construction of storage reservoirs and power stations forecast the beginning of a transformation of Sardinian economic life.

Notes on the Physiography of Honduras. 10 pages. Nels A. Bengtson.

The physiographic regions of Honduras are differentiated and the outstanding topographic features of each described.

The Soils of the Amazon Basin in Relation to Agricultural Possibilities. 28 pages. C. F. Marbut and C. B. Manifold.

This detailed soil study and authoritative statement of agricultural possibilities of the Amazon Basin embody a noteworthy contribution to our knowledge of tropical America.

Actual Temperatures of South America. 23 pages. Mark Jefferson.

A striking series of temperature graphs present all the principal types of weather found in South America.

Recent Thought on the Problem of White Acclimatization in the Wet Tropics. 11 pages. Glenn T. Trewartha.

A complete and timely summary of the trend of thought on tropical acclimatization.

Tides in Wells. 5 pages. Paul Schureman

Fluctuations in the water level in a Longport, New Jersey, well show an interesting relation to the rise and fall of the tides at Atlantic City.

THE BULLETIN OF THE GEOGRAPHICAL SOCIETY OF PHILADELPHIA

Vol. XXIV, No. 3. July, 1926

Spitsbergen. 11 pages. Johan Menander.

The growth and decline of the whaling industry in Spitsbergen.

High Light on Old Maps. 7 pages. Christine R. Thorington.

Interesting details about a few of the more familiar old maps which were artistic and full of imagination but, judged by our present day standards, inaccurate.

Notes on the Nesting of the Great Yellow-Leg in Newfoundland. 3 pages. J. R. Whitaker.

Observations of the nests and nesting habits of birds in the interior of Newfoundland.

An Ecological Survey of Pennsylvania with Reference to its Limestone Soils. 14 pages. Benjamin Druckerman.

Geographic influences in the settlement and utilization of the land in Pennsylvania.

THE JOURNAL OF LAND AND PUBLIC UTILITY ECONOMICS

Vol. II, No, 3. July, 1926

Motor Carriers and the State. 19 pages. D. E. Lilienthal and I. S. Rosenbaum.

Property Value a Basis of Rate Regulation. 6 pages. J. C. Bonbright.

State Policies in Agricultural Settlement. 13 pages. B. Henderson.
A review of state policies that aim to guide the population expanding into our agricultural areas. Policies are classified into three groups: (1) Those that actively encourage settlement; (2) those that protect settlers without necessarily encouraging them directly; (3) those that control expansion.

The Amortization of Discount, Premium, and Expenses on Funded Debt of Public Utilities. 12 pages. John H. Bicklay.

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